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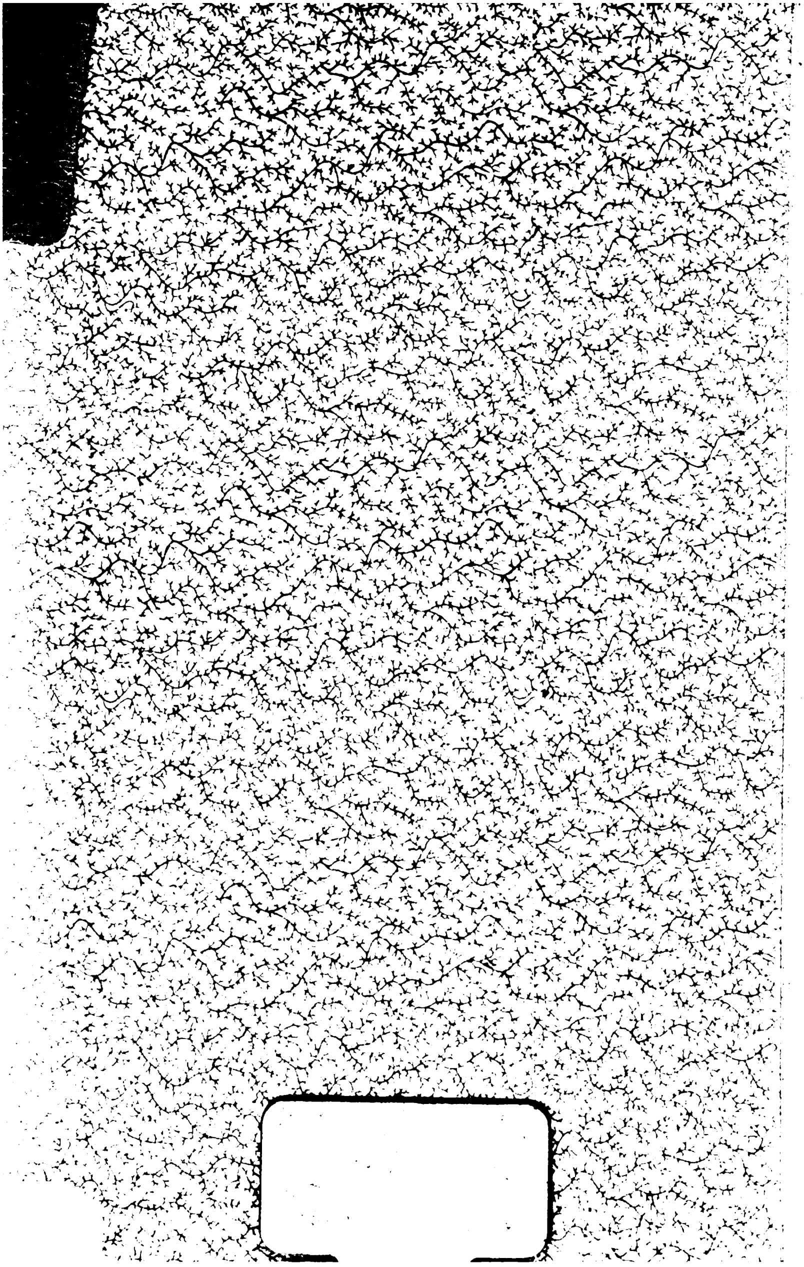

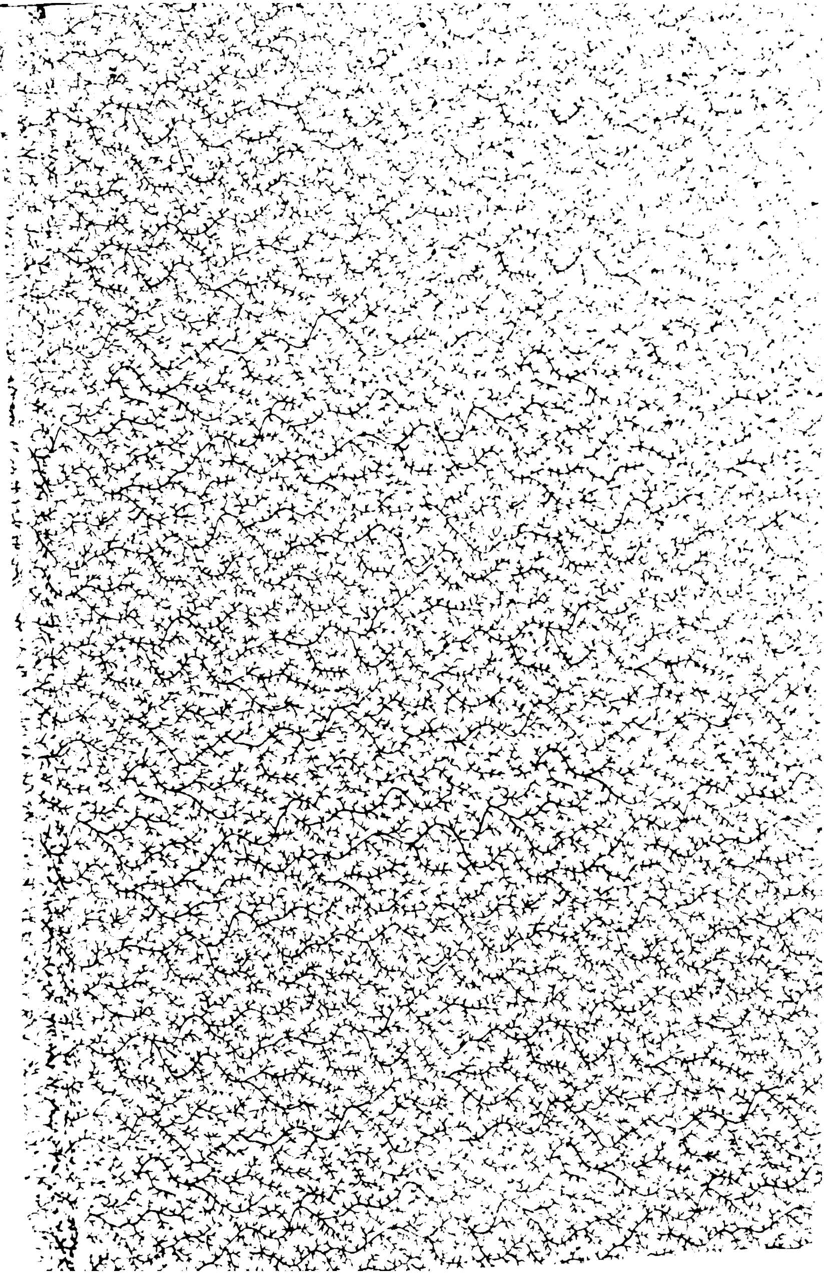

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PREFACE.

THIS book is not intended for beginners or young children, but for the middle and upper forms of schools, and for students whose standard of work is approximately that of London Matriculation.

After five introductory chapters, dealing with mathematical and general physical geography, the book contains systematic descriptions, *in decreasing detail*, of the following regions: the British Isles, Europe, North America, and the other continents. The last chapter gives a summary account of the British Empire and British Commerce. A statistical appendix shows the areas, populations, large towns, and principal productions of the chief countries of the world. "Round" numbers have been used in preference to the exact numbers given in official reports.

In compiling the following pages, continual reference has been made to four standard authorities: *The International Geography*, edited by H. R. Mill. *The Statesman's Year-Book* (annual), Chisholm's *Handbook of Commercial Geography*, and Mackinder's *Britain and the British Seas*.

Information and ideas as to methods of treatment have been obtained from many other books, of which the following may be specially mentioned: Stanford's *Compendium of Geography*; Lord Avebury's *Scenery of England* and *Scenery of Switzerland*; *A Historical Geography of the*

British Empire, and *The Relations of Geography and History,* by H. B. George; *The Expansion of Egypt,* by A. Silva White; *The Colonisation of Africa,* by Sir H. H. Johnston; *The Realm of Nature,* by H. R. Mill; the American text-books of R. S. Tarr and C. C. Adams; and the admirable school text-books of A. J. and F. D. Herbertson, and of P. H. L'Estrange. Assistance has also been derived from geographical articles published during the last few years in *The Times* and in *Nature*; and from numerous official blue-books, consular reports, and the handbooks issued by the Emigrants' Information Office.

The two weather-maps and the quotations from Meteorological Office Reports are reproduced by permission of the Controller of His Majesty's Stationery Office.

G. C. F.

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TEXT-BOOK OF GEOGRAPHY.

CHAPTER I.

MATHEMATICAL GEOGRAPHY.

Preliminary.

1. Everyone is familiar with the facts that the earth is very nearly a perfect ball or *sphere*, that it spins or *rotates* once on its axis every 24 hours, and also that it revolves yearly in an almost circular path (called its *orbit*) round the sun, from which it is distant on the average about 93 million miles.

The points where the axis of rotation of the earth cuts the earth's surface are called the north and south **poles.** This axis produced indefinitely both ways pierces the sky in two points called the north and south **poles of the heavens.** The north pole of the heavens is very near a certain star which is therefore called the Pole Star or North Star. All the stars appear to revolve once a day in circles round the heavenly poles.

A *great circle* of a sphere is a circle, drawn on the surface of the sphere, whose plane passes through the centre of the sphere. All great circles on a sphere are the same size, their radii being equal to that of the sphere. Other circles whose planes do not pass through the centre can be drawn on the surface of a sphere: these circles may have radii of any size less than the radius of the sphere and they are called *small circles.*

If the circumference of a circle be divided into 360 parts, each part subtends an angle at the centre of the circle termed a **degree**. One sixtieth part of a degree is called a **minute** and one sixtieth part of a minute is called a **second**. These three terms are represented by the symbols °, ′, ″, respectively, thus 39° 5′ 59″ denotes 39 degrees, 5 minutes, 59 seconds.

In geography these terms are also applied to the arcs of the circle subtended by the angles, and, provided that the student understands that they in strictness refer to the angles subtended at the centre of the circle, no confusion is likely to arise.

It is clear therefore that the actual length (in miles, etc.) of an arc of 1° depends upon the size of the circle of which it is a part.

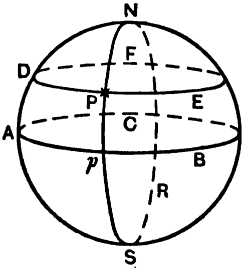

Fig. 1.

ABC: Great Circle (Equator).
DEF: Small Circle (Parallel of Latitude).
NRS: Great Circle (Two Meridians of Longitude).
NS: Earth's Axis.

The **equator** (Fig. 1) is that great circle of the earth whose plane cuts the axis at right angles. The equator is thus midway between the poles, and divides the surface of the earth into two equal parts, called *hemispheres.*

If a semicircle be drawn through the north and south poles and a given place, this semicircle is called the **meridian** of the place. Thus in Fig. 1, where *N* and *S* represent the north and south poles, *ABC* the equator, the meridian through *P* is the semicircle *NPS*. Hence at any point *P* on the earth's surface the meridian is a line drawn due north and south.

Meridians are halves of **great** circles. Small circles drawn on the earth's surface parallel to the equator are called **parallels of latitude**. In Fig. 1 *DPE* is the parallel of latitude through *P*.

Meridians and parallels of latitude intersect at right angles.

Latitude and Longitude.

2. The position of any place on the earth's surface is determined when we know its *latitude* and its *longitude.*

The **latitude** of a place is the distance measured in degrees, etc., along the meridian passing through the place, from the equator to the parallel of latitude through the place.

The portion of a meridian between the equator and either pole is one quarter of the circumference of the meridian and therefore contains 90°. Latitude therefore varies from 0° at the equator to 90° north and south at the poles.

Fig. 2 represents a section of the earth through its axis, *C* being the centre, *NS* the axis, *A* and *B* two points on the equator.

The latitude of *P* is measured by *BP* and is therefore 30° N.; that of *Q* is measured by *AQ* and is therefore 45° N.; that of *R* is measured by *AR* and is therefore 60° S.

We see that the latitude of *P* is the angle *BCP* measured in degrees, etc. But if the earth be considered as a perfect sphere *PC* gives the direction of the vertical at *P*, while *AB* represents the plane of the equator. We therefore see that the latitude of any place on the earth's surface is the angle between a vertical or plumb-line at that place and the plane of the equator.

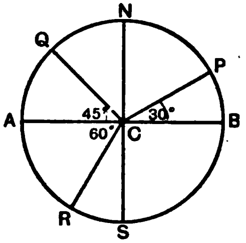

Fig. 2.

If Fig. 2 be supposed to revolve about *NS* as axis, then *P* would pass through all places on the earth's surface whose latitude is 30° N. Thus all places of equal latitude clearly lie on a small circle parallel to the equator. It is for this reason that any small circle whose plane is parallel to the equator is called a *parallel of latitude* (see *DEF*, in Fig. 1).

Determination of Latitude.

3. The **latitude** of a place is always determined, directly or indirectly, by finding the angular elevation or **altitude** of the pole of the heavens as seen from that place. Fig. 3 represents as before a section of the earth, *P* being the point whose latitude is to be determined. *PL* is a line drawn from *P* in the direction of the north pole of the heavens, which can be determined with great accuracy by observations of the stars near it. Since the pole of the heavens may be regarded as at an infinite distance from the earth, *PL* and *SQ* are parallel. To an observer at *P*, *HPD* is horizontal, since it is perpendicular to the vertical *CP*. Hence the angle *HPL* is the altitude of the pole of the heavens as seen from *P*. It is easily shown by elementary geometry that this angle *HPL* is equal to the angle *PCB*, for the two arms of the one angle are respectively perpendicular to the two arms of the other. Hence the angle *HPL* measures the latitude of the place *P*.

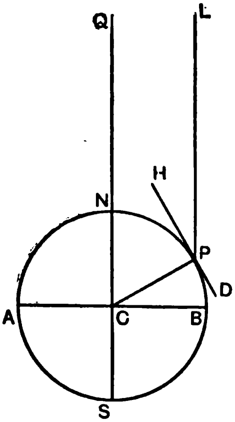

Fig. 3.

Navigating officers at sea usually find their latitude by measuring with a sextant the **altitude** of the sun at noon. The position of the sun at any given date with reference to the poles of the heavens can be found from tables published some years beforehand in the *Nautical Almanac*. In Fig. 4, if *HPD* is horizontal (compare with Fig. 3), *PS* the direction of the sun as seen from *P*, and *PL* the direction of the pole of the heavens, then the angle *DPS* is the altitude of the sun determined by the sextant; the angle *SPL* is known from the tables; and the sum of these angles, subtracted from two right angles, gives the angle *HPL*, which is equal to the latitude of the place *P*.

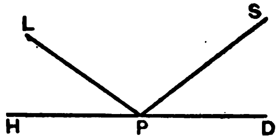

Fig. 4.

4. The **longitude** of a place on the earth's surface is the distance, measured in degrees, etc., along the parallel of latitude passing through the place, from the meridian of Greenwich to the meridian of the place.

Longitude is measured from 0° up to 180° E. for places east of Greenwich, and from 0° up to 180° W. for places west of Greenwich.

If in Fig. 1 *NDA* is the Greenwich meridian, then the east longitude of *P* is measured by the arc *DP*. This, when measured in degrees, is equal to the angle subtended by *DP* at the centre of the circle *DPE*. This is equal to the angle between the planes *NDA*, *NPS*, so that it is the angle between the tangents at *N* to the two arcs *ND*, *NP*. The longitude is therefore equal to the angle at the pole between the Greenwich meridian and the meridian of the place.

The longitude *DP* (Fig. 1) is also equal to the arc *Ap* (in degrees, etc.), for *DP* and *Ap* subtend equal angles at the centres of their respective circles.

If then we are given the latitude and longitude of a place we can find its position on a terrestrial globe as follows:—From the point on the equator where it is cut by the meridian of Greenwich, travel along the equator a distance equal to the longitude, and in the east or west direction according as the given longitude is east or west. Suppose we thus arrive at the point *p*. Then travel along the meridian through *p* a distance equal to the given latitude, and in the north or south direction according as the given latitude is north or south. We then arrive at the point required.

We thus have—

LATITUDE

is measured *in* degrees, etc.
,, *along* the meridian of the place.
,, *from* the equator.
,, *to* the parallel of latitude of the place.
,, *up to* 90° N. or S.

LONGITUDE

is measured *in* degrees, etc.
,, *along* the parallel of latitude of the place or along the equator.
,, *from* the meridian of Greenwich.
,, *to* the meridian of the place.
,, *up to* 180° E. or W.

5. The actual length of a **degree of longitude** at the equator is $\frac{1}{360}$ of the earth's circumference there, and is about 69 miles. At the poles, since all the meridians meet there, a degree of longitude has no length. At a place in any given latitude a the length of a degree of longitude is $\cos a$ times the length of a degree at the equator. By the length of the degree of longitude at this place we mean the distance between this place and another place on the same parallel of latitude, the difference between the longitudes of the places being one degree.

The actual length of a **degree of latitude**, on the other hand, is everywhere the same (about 69 miles), apart from *small* variations due to the fact that the earth is not a perfect sphere. For by the length of a degree of latitude we mean the distance between two places on the same meridian of longitude, whose latitudes differ by one degree.

Local Time.

6. The earth rotates from west to east through 360° in 24 hours, or 15° in one hour, or 1° in 4 minutes. (This rotation of the earth of course produces the *apparent* movement of the sun and other heavenly bodies in the opposite direction, east to west.) Noon at any place is the time when the meridian of longitude passing through that place comes directly beneath the sun.* The longitude of Canterbury is about 1° E. of Greenwich, and that of Reading 1° W. Therefore the meridians of longitude of Canterbury, Greenwich, and Reading pass directly beneath the sun at successive intervals of 4 minutes. Thus when it is noon at Greenwich it is 4 minutes past noon (12.4 p.m.) at Canterbury, and 4 minutes before noon (11.56 a.m.) at Reading.

It would, however, be highly inconvenient for every town and village to keep its own local time; and the whole of Great Britain takes its time from Greenwich, local time being only observed for such purposes as the lighting up of vehicles, which takes place an hour after the local sunset. In Plymouth (4° W.) this is 16 minutes later than sunset at Greenwich.

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* That is to say, when this meridian of longitude passes through the line joining the centres of the earth and sun.

Similarly the whole of Ireland takes its time from Dublin (5° W.). Thus Irish time is 25 minutes behind English time, so that a telegram from London may appear to arrive in Dublin before it was despatched.

The United States is divided into four "time-belts"—Eastern, Central, Mountain, and Pacific—whose times are respectively five, six, seven, and eight hours behind Greenwich time. Thus when it is noon at Greenwich it is 4 a.m. at San Francisco.

Jules Verne's Phineas Fogg, in going "round the world in eighty days," travelled eastward. If he crossed $4\frac{1}{2}$ degrees of longitude each *apparent* day, and at each apparent noon corrected his watch to *local* time, he would have to put his watch forward 18 minutes daily. Each of his "days" would be only 23 hrs. 42 mins. in length. In 80 apparent days he would advance the hands of his watch 80 times 18 minutes, or 24 hours altogether, so that 80 apparent days is equivalent to 79 real days, and he would appear to have gained a day. Conversely, in travelling westward, each apparent day would be longer than a real day, and the traveller would appear to lose a day.

The Date Line.

We have seen above that the local time is later than Greenwich time by 4 minutes for each degree of longitude going eastward, and earlier by 4 minutes for each degree of longitude going westward.

Thus if we travel eastward to a place *A*, very nearly in longitude 180° E., we find the local time at *A* is very nearly 12 hours *later* than that of Greenwich, so that when it is, say, 7 a.m. on Thursday, August 19th, in Greenwich, it is very nearly 7 p.m. of Thursday, August 19th, at *A*.

If we travelled westward to a place *B*, very nearly in longitude 180° W., the local time at *B* would be very nearly 12 hours *earlier* than that of Greenwich, so that when the time at Greenwich is 7 a.m. on *Thursday*, August 19th, at *B* it would be very nearly 7 p.m. on *Wednesday*, August 18th.

Thus two places in longitude 180° E. or 180° W. (for these are the same), one on one side of the meridian and the other on the other side of the meridian, agree as to time of day but differ *by one day* as to the date.

The confusion of *dates* that would arise from the cause explained in the preceding paragraph is avoided by the addition of a day at longitude 180° (*i.e.* giving the same date to two consecutive days), if, when one crosses the 180° meridian, the ship is sailing eastward, and by the dropping of a day from the calendar if it is sailing westward.

The "Date Line," however, does not exactly follow the line of 180° longitude, but has a zig-zag course through the Pacific, in order to avoid its passing through groups of islands, where the difference in *date* between two neighbouring islands under the same administration would involve hopeless confusion.

7. The longitude of a place is measured by comparing its local time with Greenwich time. For this reason accurate chronometers, set to Greenwich time, form one of the most essential parts of the equipment of a ship which makes long voyages. The local time is most easily obtained by observing when the sun reaches its greatest altitude: this will, of course, be local noon.

Example.—*Find the longitude when local noon occurs at* 7.20 *a.m. by Greenwich time.*

Local noon occurs before Greenwich noon, hence the longitude is *east.*

The difference of time is 4 hrs. 40 mins., *i.e.* 280 minutes; hence the difference of longitude is 280 ÷ 4 or 70°.

Result: 70° E.

Two "coordinates" only are required to fix exactly the position of any point on a surface. In the case of the earth these coordinates are latitude and longitude. Any number of places may have a given latitude *or* a given longitude, but only one place can have *both* a given latitude and a given longitude.

Inclination of the Earth's Axis.

8. The plane in which the earth moves round the sun is called the *ecliptic.* The earth's axis of rotation has a nearly fixed direction in the heavens, making an angle of about 66½° with the ecliptic. This fact is the cause of the variations in the lengths of the **day** and **night** and the cause of the phenomena of **summer** and **winter.**

Variations in the Lengths of Day and Night.

9. Take a knitting-needle and pass it through the centre of an orange (or round ball), to represent the earth and its axis *NS* (Fig. 5*a*). On the orange draw a "great circle" *QR* half-way between the ends of the axis to represent the equator, and draw a number of "small circles," *CD*, *EF*, *GH*, *KL*, parallel to the equator to represent parallels of latitude. Place a lighted lamp on a table and hold the orange on a level with the lamp with the knitting-needle at right angles to the table. Now tilt the needle towards the lamp so that it makes an *acute* angle with the line joining the orange to the lamp.

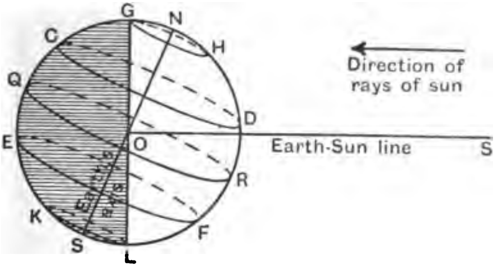

Fig. 5*a*.

It will be seen that, as in Fig. 5*a*, in the upper part of the orange (*i.e.* the part above the equator), *more than one half of each parallel of latitude* is in the light and less than one half is in the shade. If therefore the orange be rotated uniformly round the needle, any point in the upper part of the orange will be longer in the light than in the shade.

10. It follows that (Fig. 5 *a*), when the axis of the earth makes an acute angle with the line joining the centre of the earth to the sun (which we will, for brevity, call the earth-sun line), for every place in the **northern** hemisphere *the day time will be longer than the night, i.e. the day time will be more than twelve hours and the night less than twelve hours.* Similarly, under the same conditions, in the **southern** hemisphere the day is less than twelve hours and the night more than twelve hours.

If the axis is moved towards the light so as to make an angle of 66½° with the earth-sun line, the *whole* of the parallels of latitude from 66½° N. to the North Pole (*i.e.* from *HG* to *N* in Fig. 5 *a*) are continuously in the light.

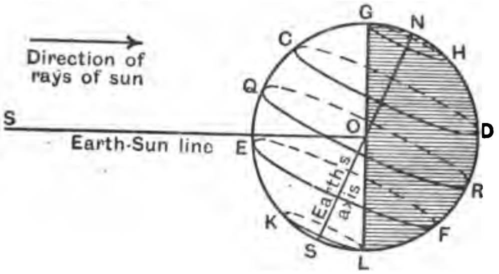

Fig. 5 *b*.

The sun is thus above the horizon during the whole of the day. This period is called the **perpetual** day.

Similarly all the places between latitude 66½° S. and the South Pole (*i.e.* between *KL* and *S*) are continually in darkness.

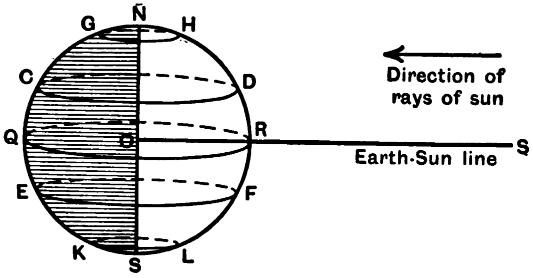

Fig. 5 *c*.

If we next incline the upper part of the needle away from the light we can with the aid of Fig. 5 *b* deduce the following results.

When the earth's axis is inclined *from* the sun, making an angle of 113½° with the earth-sun line, the day is less than 12 hours in the northern hemisphere and greater than 12 hours in the southern hemisphere. Also all places between latitude 66½° N. and the North Pole are in continual darkness, and all places between 66½° S. and the South Pole are in continual light.

Similarly, when the earth's axis, though still inclined to the ecliptic at an angle of 66½°, is at *right angles* to the earth-sun line, as in Fig. 5 *c*, one half of every parallel of latitude is in the light and one half in the darkness. The day and night are then each 12 hours long.

Now (Fig. 6) at the vernal equinox, March 21st, the earth's axis, though making an angle of 66½° with the ecliptic, is at right angles to the earth-sun line, so that the days and nights then are of equal length. Hence the term "**equinox**" (*aequus*, "equal"; *nox*, "night").

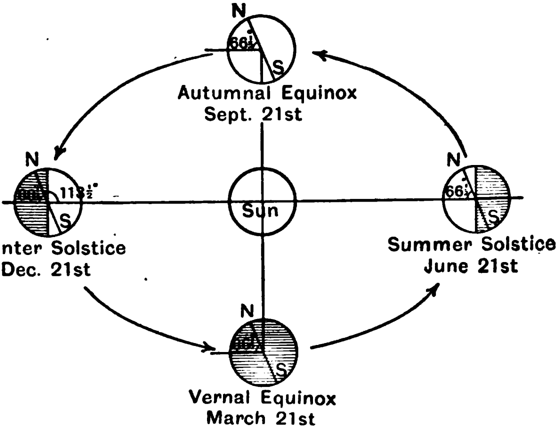

Fig. 6.

As the earth proceeds in its orbit round the sun, the constancy of the direction of its axis in space causes it to incline more and more to the earth-sun line; while at the summer solstice, June 21st, it makes an angle of 66½° with that line. Hence in the northern hemisphere the days lengthen and the nights shorten until June 21st, while the region of perpetual day extends from the North Pole to latitude 66½° N.

From the summer solstice to the autumnal equinox, September 23rd, the inclination of the earth's axis to the earth-sun line increases from 66½° to 90°. Thus in the northern hemisphere the days, though still longer than the nights, shorten, so that on September 23rd they are equal. The region of perpetual day gradually diminishes, so that, on September 23rd, it is only at the North Pole that the sun is constantly in view, where it will be on the horizon.

From the autumnal equinox to the winter solstice, December 22nd, the inclination of the earth's axis to the earth-sun line increases until, on the latter date, it makes an angle of (180°-66½°) or 113½° with the earth-sun line. During this period the days shorten and the nights lengthen so that the days are shorter than the nights, while a region of "perpetual darkness" spreads from the North Pole to latitude 66½° N.

From the winter solstice to the vernal equinox, March 21st, the inclination of the earth's axis to the earth-sun line diminishes until, on the latter date, they are at right angles. Thus the days, though still shorter than the nights, lengthen, so that on March 21st they are equal. The region of perpetual darkness round the North Pole gradually diminishes during this period.

In the **southern hemisphere** the above conditions are entirely reversed, that is to say, when our days are longest the days in the southern hemisphere are shortest, and *vice versa.* There will also be a period of continual darkness round the South Pole, when the parts round the North Pole are in continual light, and *vice versa.*

Zones of the Earth.

11. We have seen that places north of latitude 66½° N. have, during a part of the year, "perpetual day" and six months later "perpetual night," and that these effects are also seen in latitudes between 66½° S. and the South Pole. The parallels of latitude bounding these areas are called respectively the **Arctic Circle** and the **Antarctic Circle.**

At places on the equator the sun is vertically overhead at midday on March 21st and September 23rd. As the axis of the earth inclines to the earth-sun line the sun becomes overhead at midday at places north of the equator. The most northerly and most southerly places at which the sun is ever overhead are those in latitudes 23½° N. and 23½ S. These latitudes are called the **Tropic of Cancer** and **Tropic of Capricorn** respectively. The portion of the earth between the Tropics is called the **Torrid Zone.**

The portion between the Tropic of Cancer and the Arctic Circle is called the **North Temperate Zone,** and that between the Tropic of Capricorn and the Antarctic Circle is called the **South Temperate Zone.**

The portions north of the Arctic Circle and south of the Antarctic Circle are called the **Frigid Zones,** and are distinguished as the **Arctic** and **Antarctic Zones.**

The Seasons.

12. The amount of heat received from the sun at any place on the earth's surface depends mainly upon three things:—

(i) The *time* during which the place is exposed to the sun's rays;

(ii) The *direction* of the rays relative to the surface heated;

(iii) The *distance* of the sun from the earth.

Now, considering the northern hemisphere, we have seen that during the summer the days are more than 12 hours. Also from the experiments in § 9 we see that the sun is on the average much higher in the heavens in summer than in winter; that is, the surface of the earth is more nearly at right angles to the rays of the sun in summer than in winter. Now oblique rays have to pass through a deeper layer of air than vertical rays, thus suffering more absorption, and, more important still, they are spread over a greater area than vertical rays, and thus produce a less heating effect (see Fig. 32). Hence the quantity of heat received on each square foot of the surface in a given time will be greater in summer than in winter. The amount of heat received, as far as it depends on these two causes, is therefore much greater than the average, and the maximum amount of heat is received at the summer solstice.

On the other hand, the earth is farther away from the sun during the summer than during the winter. The difference of distance is, however, comparatively so small that the greater distance from the sun does not diminish the heat to any perceptible degree.

13. It is important to notice that, though the northern hemisphere is receiving the greatest amount of heat *at* the summer solstice, June 23rd, the highest average temperature occurs at some time *after* the summer solstice, —viz. about the end of July—and the lowest temperatures similarly occur after the winter solstice.

For the northern hemisphere is *gaining* heat most rapidly about the summer solstice (*i.e.* receiving more than it radiates away) and *it continues to gain heat,* though to a less extent, for some time afterwards.

Similarly, the northern hemisphere is losing heat most rapidly at the winter solstice, and it continues to lose heat, though to a less extent, for some time afterwards.

In a similar manner, the hottest time on a summer's day is not *noon,* but about 2 p.m. in the afternoon, and the coldest time in the winter is not midnight, but about 2 a.m.

Effect of the Refraction of Light.

14. Daylight does not begin and end at the moments when the centre of the sun is on the horizon. When a ray of light enters the atmosphere obliquely, it is, for reasons explained in text-books of physics, *refracted* or bent out of its original direction ; moreover, as it approaches the earth, it passes through layers of air increasing in density, with the result that it becomes more and more bent from

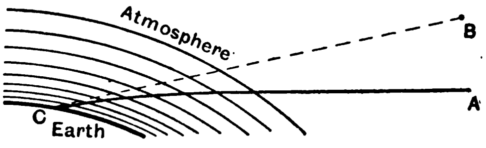

Fig. 7.

A, REAL POSITION OF SUN ; *B*, APPARENT POSITION OF SUN ; *C*, OBSERVER.

its original direction (see Fig. 7). As we judge the position of any object solely from the direction in which light from it reaches the eye, the effect of this refraction of light is to make the sun appear always higher above the horizon than it really is, and to make it visible even when it is (astronomically) a little *below* the horizon. The result is, of course, to make the actual duration of sunlight somewhat greater. At the equator this lengthening of the day by refraction only amounts to about 10 minutes, in latitude 50° it is about 20 minutes, and in latitude 65° more than an hour. Owing to refraction, the "midnight sun" can be seen on June 21st at places some distance south of the Arctic Circle.

Twilight.

15. The familiar fact that daylight does not cease abruptly with sunset, but dies away very gradually for some time afterwards, is also due to the atmosphere. But for the atmosphere, sunset would be equivalent to putting out a lamp in a dark room; there would be neither dusk nor dawn.

When the sun is only a little way below the horizon, the upper layers of the atmosphere are still exposed to direct sunlight, which is there reflected and dispersed by the dust and water particles contained in the air. This diffused light reaches the earth and constitutes **twilight.**

Twilight lasts until the sun is about 16° below the horizon. In the tropics, where the sun descends almost perpendicularly to the horizon at sunset, twilight is naturally much shorter than in higher latitudes, where the sun's path is much more oblique. Even in the Arctic regions, where the sun is never visible in winter, there is a certain amount of twilight each day, except within about 6° of the pole.

In England twilight is legally recognised as lasting an hour, "lighting-up time" for vehicles being fixed for one hour after sunset. In reality, however, twilight lasts much longer than this. In fact, at midsummer in our latitudes twilight is visible on the northern horizon throughout the night. The reason of this is that the sun, even at midnight, is not, at midsummer, so much as 16° below the horizon, and therefore twilight is continuous from sunset to sunrise.

The Shape of the Earth.

16. The earth, as has been already mentioned, is not a perfect sphere. It is more nearly an "oblate spheroid of revolution," namely, the figure produced by the revolution of an ellipse round its shorter axis. The polar diameter is shorter than the equatorial diameter by about 27 miles, or, roughly, $\frac{1}{300}$ of the diameter.

There are some minor irregularities (apart from mountains, etc.), so that the earth does not *exactly* resemble any geometrical figure. It is, however, so nearly a sphere that the difference would be quite inappreciable to the eye, if it were possible to view the earth as a whole. Owing to the relative flatness of the earth near the poles, a degree of latitude there is about one per cent. greater than a degree at the equator.

The Representation of the Earth's Surface.

17. It is impossible on a plane to represent truly the surface of a sphere. **Globes** furnish the only means of representing the earth accurately. On the other hand, globes of any practicable size, though very useful in considering certain problems, are much too small to show details of the earth's surface, and **maps** have to be used.

In the making of maps the spherical surface of the earth has to be *projected* on to a plane, and this can be done in many different ways, different methods of projection being used according to the purpose of the map and the area of country represented on it.

18. In **orthographic projection** the eye of the observer is supposed to be at an infinite distance from the earth, so that all lines drawn from it to the earth are parallel. The various points of the hemisphere are projected on a plane *PL*, the points *A*, *B*, *C* on the globe being represented by *a*, *b*, *c* on the map.

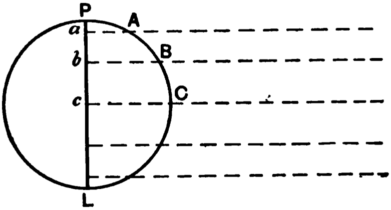

Fig. 8.

It is obvious from Fig. 8 that a map of a hemisphere constructed by this method will only show the central portions at all correctly, the outer parts of the map being much distorted and diminished in area.

This projection is, however, fairly suitable for maps of the polar regions, in which the pole forms the centre of the map (*C* in Fig. 8); parallels of latitude then become circles, and the meridians are represented by straight lines radiating from the pole.

In **stereographic projection** the eye is supposed to be placed at a point *E* on the surface of the globe, and to be looking through the central plane *PL* at the opposite hemisphere. *CB*, *BA*, ... are equal distances on the globe. The corresponding distances *cb*, *ba*, etc., on the map *increase* towards the edge of the map. Thus the distortion produced by this projection is just the reverse of that produced by the orthographic projection.

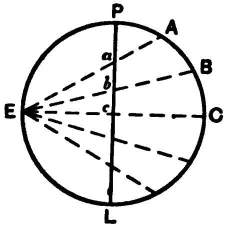

Fig. 9.

As distortions of opposite kinds are produced by placing the eye at infinity and at the surface of the globe, there must be some intermediate position where these distortions will roughly neutralise each other. This position is at a point *E* (Fig. 10), such that *EM* is half of *ML*. Lines drawn from *E* to equidistant points *A*, *B*, *C*, etc., on the opposite surface of the globe intersect the plane *PL* in the points *a*, *b*, *c*, etc., which are also very nearly equidistant. This projection, known as the **equidistant** or **globular** projection, is that one now generally used in maps of the world in hemispheres.

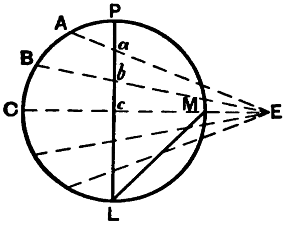

Fig. 10.

19. In **conical projections** advantage is taken of the geometrical properties of the cone. The cone is one of those geometrical figures whose curved surface can be reduced to a plane (*i.e.* spread out flat) without any distortion. If a cone be imagined touching the surface of the earth along a parallel of latitude *PQ*, then it will be seen (Fig. 11) that any portion of the surface of the globe, such as *ABCD*, enclosed by parallels not very distant from *PQ*, would be represented with considerable accuracy by its projection, formed by lines drawn from the centre of the sphere on to the cone.

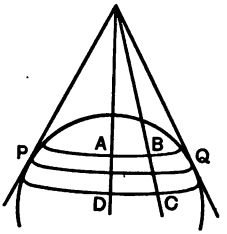

Fig. 11.

This projection can be made still more accurate if the imaginary cone be made not to touch the sphere but to intersect it in two parallels, dividing the space to be mapped into three equal parts. The **conical projection** is the one most used for maps of separate countries. It is not suitable for representing more than about 30° of latitude.

20. The method of projection known as **Mercator's** depends on the fact that the curved surface of a cylinder, like that of a cone, can be spread out flat to form a plane. The sphere is supposed to be enclosed by a cylinder which touches it at the equator, and the different parts of the surface are projected on to the cylinder by lines drawn from the centre of the sphere (Fig. 12).

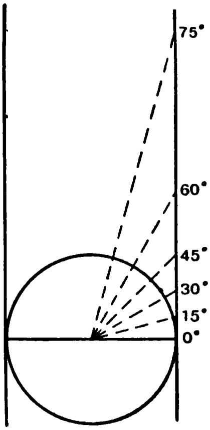

Fig. 12.

Meridians of longitude, which in reality converge to the poles, become, in this projection, parallel straight lines. Parallels of latitude, which are small circles on the globe, become great circles on the cylinder, and straight lines when the cylinder is unrolled into a plane.

A degree of longitude on the earth's surface in Lat. 60° is only half as long as a degree at the equator; but in maps drawn by this projection all degrees of longitude are equal. There is therefore in high latitudes a great deal of exaggeration.

The figure shows that the distance on the map corresponding to a degree of latitude increases as the latitude increases, and above Lat. 60° the exaggeration becomes enormous.

Mercator's projection, though it gives no true idea of distances and areas (except near the equator), is of special importance to navigators because it gives *directions* accurately. To keep a good course between two given points, a ship must keep a constant inclination to the meridians over which it passes. On Mercator's projection this course is represented by a straight line (since all the meridians are straight and parallel), whereas on other maps the line would be curved. Hence seamen always use charts made on Mercator's projection, except for sailing in very high latitudes, where "great circle sailing" is adopted.

The shortest distance between any two points on the earth's surface lies along a great circle of the earth. In low latitudes the difference between "great circle sailing" and "Mercator sailing" is very small; but in high latitudes, especially between places not differing much in latitude, a considerable saving can be effected by sailing along a great circle; if, however, the places differ very much in longitude a great circle course may take the ship far into the region of icebergs. The shortest path between Cape Horn and Melbourne would be one quite impossible to sail, as it would cross the great southern ice-pack, not very far from the pole.

The Scale of Maps.

21. The scale of a map is the **ratio** which its **linear** dimensions bear to the linear dimensions of the region represented. The scale may be expressed either as a fraction with unity as numerator, or in terms of units of length. Thus the general map of the British Ordnance Survey is on a scale of one inch to a mile, which is also a scale of $\frac{1}{63360}$, since 63,360 inches are equal to one mile.

Map Reading.

22. We have so far considered maps as simply representing the positions of places as determined by two coordinates, latitude and longitude. But space is of three dimensions, and it is equally important to consider the vertical dimension, *i.e.* height above or depth below sea-level, the only practicable zero-line from which measurements of height or depth are made. It is impossible for a map to give a good general idea of any portion of a country unless it represents in some way the varying elevations of the land—mountain, valley, and plain—which are of such supreme importance in determining the flow of water, and in their effect on climate. We have therefore to consider the chief ways in which **land-relief** is represented on maps.

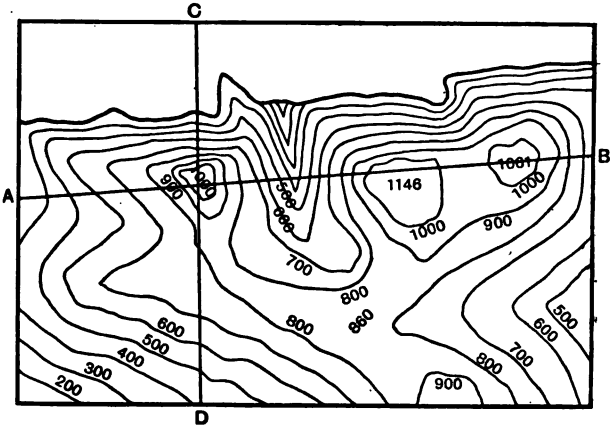

Fig. 13.

The simplest way to delineate the general form of the land is by means of **contour lines**, which are lines joining together places of equal elevation. Places on the map where contour lines are crowded together are places of steep slope, and where the lines are far apart the slope is gentle. If the lines are sufficiently numerous—say at intervals indicating differences of height equal to 100 feet in mountainous regions, and 25 feet in flatter districts—they give a very effective representation of the land-relief.

Fig. 13 shows contour lines drawn, one for each 100 feet increase in height, in a portion of a very hilly coast district.

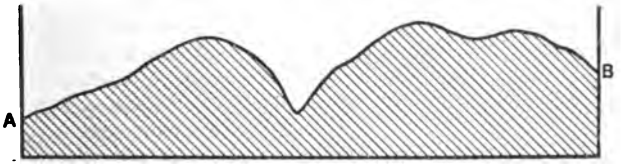

Fig. 14.

The scale is one inch to a mile. A study of the map gives us the following information:—

A narrow and very steep little valley occupies the middle of the district, and is hemmed in on both sides by heights of somewhat over 1,000 feet, the hill on the east side having two peaks of nearly equal height. Further inland the land slopes down again into two valleys, running east and west, and separated by a neck 860 feet in height. On the coast itself the contours are so close that they cannot be separately drawn on this scale till the line of 400 feet is reached. It may therefore be assumed that, except at the mouth of the valley, the cliffs are almost vertical up to about 300 feet.

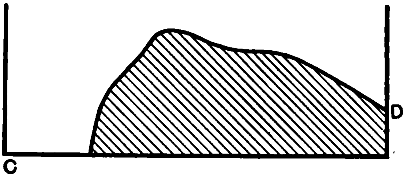

Fig. 15.

Figs. 14 and 15 represent sections of the land drawn respectively from *A* to *B* and from *C* to *D*, by means of the data furnished by the contoured map. The vertical scale is $\frac{1}{16}$ inch to 100 feet. The horizontal scale is, as before, one inch to a mile, or $\frac{1}{16}$ inch to 330 feet. Thus the vertical scale is exaggerated about $3\frac{1}{3}$ times, *i.e.* the slopes in the drawings are $3\frac{1}{3}$ times as steep as the actual slopes.

For such a hilly region as this map represents the exaggeration of the vertical scale is not necessary; but to draw sections of a fairly flat district or of a very large one, it is necessary to magnify very considerably the vertical dimensions of the drawing. A section of a continent drawn accurately to scale would, unless the scale were a very large one, appear merely as a straight line, since the height of even the highest mountain is insignificant in comparison with the width of a continent.

In many maps the slopes of the land are shown by "hill-shading." This consists of "**hatchings**," or lines crossing the contours at right angles,* the density of the shading being made proportional to the slope.

In "**orographical**" maps the spaces between the contours are tinted, either by different shades of the same colour, or by different colours. This method is very effective in showing the general land-relief of a large country.

Maps in which the configuration of the land is shown with special prominence are generally known as "**physical maps**," to distinguish them from "political" or "commercial" maps, in which emphasis is laid on the results of human activity—towns, boundaries, trade routes, etc.

The maps so far considered may be described as "**general**" maps. They are intended merely to represent the relative positions of places, and the relief of the land. Special maps of innumerable kinds are also prepared, to represent graphically particular sets of facts. Thus we have maps of **climate**, showing the distribution of pressure, temperature, rainfall, etc.; railway maps; road maps (the oldest of all special maps); maps showing, *e.g.*, density of population, distribution of vegetation, the results of a general election, or the prevalence of consumption; and others too numerous to mention.

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* The hatchings are therefore lines of steepest slope.

Suggestions.

23. The student should accustom himself to careful study of maps of all kinds, with a view to extracting from them all the information possible. It is especially important to consider the river-system of any country in close connection with the land-relief, since the main features of the river-system are usually a direct consequence of the configuration of the land.

The following exercises may be suggested, especially in connection with the geography of the United Kingdom:—

(1) **Drawing sections** in various directions from data furnished by contoured or orographical maps; *e.g.* from Dover to Holyhead, Brighton to Cambridge, Liverpool to Flamborough Head, Carlisle to Inverness, etc.

(2) Marking on a good "physical" map the **routes** of some of the chief main lines of railway, and then writing a description of the physical features of the route, with special attention to deducing from the map the varying elevations, deep cuttings, tunnels, bridges, etc.

[N.B.—Much may be learnt by personal observation during railway journeys.]

(3) **Comparison** of a "population" map with (*a*) a "physical" map of the same region, and (*b*) a map showing coal-fields and iron ores.

(4) **Comparison** of "vegetation" maps, if available, with maps of rainfall, temperature, and density of population.

CHAPTER II.

THE ATMOSPHERE AND ITS CIRCULATION.

COMPOSITION OF THE ATMOSPHERE.

24. Air is a rather complex mixture of gases, but consists essentially of oxygen, nitrogen, and argon, with a trace of carbon dioxide, and a small but very variable amount of **water vapour**, produced chiefly by evaporation from the surface of seas, lakes, and other bodies of water. Air also always contains a certain minute quantity of solid matter in the form of **fine dust**. Even the purest mountain air is never perfectly free from dust.

PRESSURE.

25. Since air resembles every other form of matter in possessing weight, it exerts **pressure** on all surfaces exposed to it. At sea-level the average pressure of the air amounts to nearly 15 pounds on each square inch. Atmospheric pressure, however, is almost always expressed, not as a weight, but as a **height**, *i.e.* the height of a column of mercury, the pressure of which is equal to that of the air. This height is measured by means of a **barometer** (Fig. 16), and is known as the "height of the barometer." At sea-level this height is on the average nearly 30 inches, but is constantly changing. It is almost always, however, between 28 and 31 inches. In Fig. 16, the long branch of the tube is closed and contains no air: the short branch is open to the air, and the atmospheric pressure supports the column of mercury between the two dotted lines.

In the air, as in every other fluid, the pressure is greater at lower levels than at higher. In a practically incompressible fluid like water, the pressure is simply proportional to the depth. Gases, however, are highly compressible, and hence, not only is the atmospheric pressure at sea-level greater than it is on the sides or at the summit of a mountain, but the air itself is denser, *i.e.* a given volume of it weighs more than the same volume of air at a higher level.

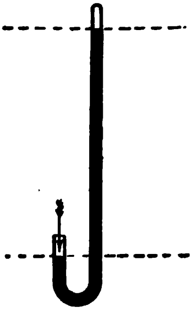


Fig. 16.

Owing to this fact that the lower layers of air are denser than the upper layers, one half of the whole atmosphere lies below a height of about 18,000 feet (about 3½ miles), and about seven-eighths of it below 10 miles, although there are indications that air in a very rarefied state extends to a height of at least 200 miles from the earth's surface.

For ordinary heights an elevation of 1,000 feet makes a difference of about one inch in the height of the barometer; at great altitudes, where the air is much less dense, an extra elevation of 1,000 feet makes much less difference in the barometric height.

The height of the barometer is one of the signs used for forecasting the weather. For this purpose, in order to make barometric observations at different altitudes comparable one with another, the actual readings of the barometer are reduced to what they would be at sea-level.

26. From the geographical point of view the chief features of the atmosphere that claim attention are (1) the phenomena due to the **water vapour** in the air; and (2) the **motions** of the air (winds).

EVAPORATION AND CONDENSATION.

27. There is a definite limit to the amount of water vapour that a given volume of air can contain at any given temperature. When this limit has been reached the air is said to be **saturated**. The higher the temperature, the greater is the amount of water vapour necessary to produce saturation. When water is exposed to unsaturated air, the process of **evaporation** goes on at a rate depending on the temperature and pressure. When, on the other hand, saturated air is either cooled or subjected to an increased pressure, the converse process of **condensation** takes place, *i.e.* part of the water vapour is condensed to liquid water.

As stated above, air is never free from dust, except when specially filtered; and it has been proved that, when condensation of water vapour takes place, each minute drop of water is formed around a **particle of dust** as a nucleus; in fact water vapour never condenses except upon a solid surface.

Clouds.

28. As a rule the drops of water formed upon dust particles are at first so small that they remain suspended in the air for a long time, just as dust itself does. This "water-dust," as it might be called, constitutes a **cloud**; or, if it happens to be formed close to the earth's surface, a **fog** or **mist**. A cloud is simply a mist at a high level—though some of the highest clouds (the light feathery clouds) probably consist of minute ice particles.

Clouds have an important effect on climate in diminishing extremes of temperature. They act as screens, lessening the effect of the sun's heat during the day, and intercepting the heat radiated from the earth at night. It is a matter of common experience that the clearest nights are also the coldest.

In very dusty air, as in towns, the number of dust particles is so great that the drops of water formed are excessively numerous. Hence city fogs are usually thicker than those formed in the country.

Rain.

29. When water vapour condenses in a place where dust particles are comparatively few, the drops of water formed are correspondingly large, and are of sufficient weight to fall quickly. They increase in size by gathering smaller drops as they fall. The result is **rain**, one of the most important factors of climate.

The rainfall of a place is measured by the **rain-gauge**. This instrument is essentially a funnel, which collects all the rain that falls on a definite area, usually a circle of five or eight inches in diameter. Rainfall is stated in terms of the depth of water which would accumulate on a level surface if all the rain stayed where it fell, without running off, or sinking into the ground, or evaporating. Places which have an average rainfall of less than 10 inches a year would be described as very dry, and are usually more or less desert; rainfall rarely exceeds 50 inches a year, except in mountainous regions.

Snow and Hail.

30. When water vapour is condensed at a temperature below the freezing point (32° F.), it forms **snow** instead of rain. A snow-flake consists of a large number of small hexagonal crystals of ice, matted together. A snow-fall one foot in depth is approximately equal to one inch of rain.

Hail is of two distinct kinds—winter and summer hail. Winter hail is merely a specially compact form of snow, and is probably formed by the fall of the larger particles from an ice-cloud. Summer hail, however, consists of lumps of solid ice, which often fall during thunderstorms, and are sometimes very destructive.

A **hailstone** is probably formed in the following way:—A nucleus of soft snow falls from an ice-cloud into a rain-cloud, where water condenses round it; an ascending current of air then carries it up into a region where the temperature is again below the freezing point. Here the coating of water freezes to ice, and another layer of snow is formed outside. This process may be repeated several times before the hailstone finally reaches the earth, as several alternate layers of ice and snow have been found in large hailstones.

CIRCULATION OF THE ATMOSPHERE.

31. The movements of the atmosphere are due to differences of **pressure** in different parts of it, caused by differences of **density**, which in their turn are the result of differences of **temperature**. When any part of the air increases in temperature it expands, and therefore, becoming less dense, tends to rise to a higher level. The pressure of the heated air becomes less than that of the surrounding atmosphere, and air is therefore driven in to equalise the pressure. Around an open fire, as everyone knows, there is on all sides an in-draught of cold air near the ground, and above the fire a rising current of warm air.

Very much the same thing takes place, but on an immensely larger scale, all along the equatorial or hottest belt of the earth's surface.

32. Wind always blows from regions of high pressure to those of low pressure; but the actual direction of the wind is modified to a great extent by the rotation of the earth. The velocity of rotation of the earth's surface is obviously greatest at the equator, diminishing to zero at the poles. Thus a body moving, say, southwards towards the equator is passing over a region where the earth's eastward velocity is constantly increasing.

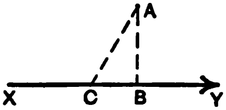


Fig. 17.

Suppose that a shot is fired from a point *A* in the direction *AB* at a body *XY* moving in the direction shown by the arrow (Fig. 17). The shot would strike the object not at *B*, but at some point *C* behind *B*, at a distance depending on the relative velocities. *So far as the moving body is concerned*, the shot comes in the direction *AC*, not *AB*. Relatively to the moving body the shot has been made to deviate to the right of its original path. Similarly if a body or a current of air moves in the direction *AB* (Fig. 18) over a large rotating plane, *the movement of which is not apparent to anyone upon it*, then the moving body will occupy successively positions such as *A*, *D*, *E*, *F*, *C*, and its *apparent* path, considered *only* from the moving plane, will be a curved line, deviating as before to the right of the original direction.

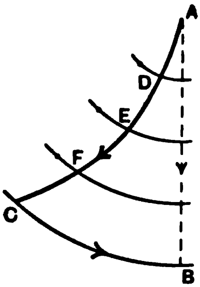


Fig. 18.

The facts deducible from the foregoing argument were summed up as follows by Buys-Ballot:—*Any moving body on the earth's surface (including a current of air) tends to be deflected from its course, the deflection being to the right in the northern hemisphere, and to the left in the southern hemisphere.*

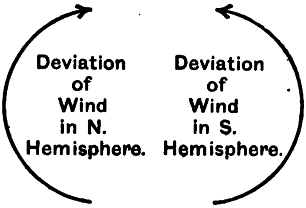

Deviation of Wind in N. Hemisphere.
Deviation of Wind in S. Hemisphere.

Fig. 19.

This rule may also be expressed as follows:—*The deviation of a moving body on the earth's surface is in a clockwise direction in the northern hemisphere, and in a counter-clockwise direction in the southern hemisphere* (Fig. 19).

PERMANENT WINDS.

33. The actual distribution of pressure on the earth's surface is very complicated, but it has certain permanent features that are of the highest importance. Over the hottest part of the surface there is a perpetually rising current of warm moisture-laden air. There is therefore a belt of **permanent low pressure** along the equator. About Lat. 30°-35° north and south there are belts of **permanent high pressure**, from which winds blow both pole-wards and equator-wards. These winds, however, instead of blowing due north and south, as they would do if the earth were at rest, are deflected in accordance with Buys-Ballot's law, and blow as represented in Fig. 20.

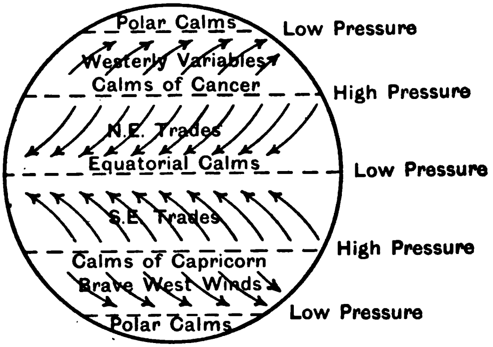


Fig. 20.

Permanent Winds and Calms.

The net result is a general circulation of air westward in the torrid zone, and eastward in the temperate zones. This circulation of air has important effects on climate, making almost all eastern tropical coasts and all western temperate coasts rainy.

The winds which blow from the tropics towards the equator have been known for centuries as **trade winds**, because until the days of steamships they were of great importance to navigation.

The westerly winds of higher latitudes (about 35° to 60°) are often called **anti-trades**, but this term is also sometimes applied to the return currents of air from the equator in the higher atmosphere above the trade winds.

The belts of calms and variable winds about Lat. 30° north and south are known to sailors as the **horse**

latitudes. There is also an equatorial belt of calms called the **doldrums**, which was much dreaded by sailors in former days on account of the difficulty they experienced in getting through it, its unpleasantly high temperature, frequent terrific thunderstorms and deluges of rain.

34. Fig. 20 would represent pretty accurately the actual distribution of pressure and the directions of the winds if the earth were uniformly covered with water. In the southern hemisphere, and especially south of Lat. 30° S., the earth **is** almost entirely covered with water, and the actual state of the atmosphere corresponds closely with that shown in the diagram. Thus the "Brave West Winds" of the **Roaring Forties** in the southern hemisphere are much more constant than the westerly winds of northern latitudes, and determine the track of sailing-ships round the world, the route followed being almost always eastward.

The system of winds above described moves north and south annually with the apparent movements of the sun, but not nearly to so great an extent as the sun. In the northern summer the equatorial belt of calms lies only some 5° north of the equator, and is nearly the same distance to the south during the northern winter.

35. As implied above, large land-masses modify considerably the simple system of atmospheric circulation so far described. This arises (1) from the deflection of surface winds by mountain ranges, (2) from the fact that land varies far more in temperature than water does under similar conditions. This last is a fact of common observation, due chiefly to the following causes:—

(*a*) Water has a very high "specific heat," *i.e.* to raise the temperature of a given weight of water one degree requires much more heat than is required to raise by one degree the temperature of an equal weight of any solid material.

(*b*) Water circulates freely, and therefore warm and cold water are continually being mixed up.

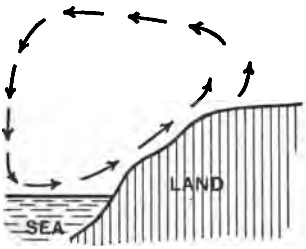
(*c*) Evaporation, which becomes more rapid in hot weather, has a cooling effect on water, and thus tends to prevent extremes of temperature.

SEASONAL WINDS.

36. The great variations in the temperature of the land are the chief cause of **seasonal** or **periodic winds**, as distinguished from the permanent winds due to the form and movements of the earth as a whole.

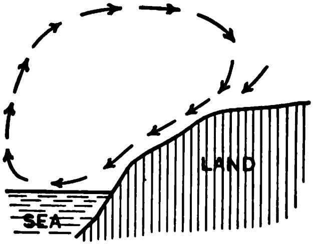
Land and Sea Breezes.

37. In clear hot weather at places near the sea where there is no strong prevailing wind, there are regular daily changes in the circulation of the air. During sunshine the land becomes hotter than the sea. The increase in temperature spreads to the air above the heated land, which therefore tends to rise. Thus a local difference in pressure is established, resulting in a **sea-breeze** (Fig. 21). At night, especially when the sky is cloudless, the land becomes much colder than the sea, and therefore the circulation of the air is reversed, and a **land-breeze** is the result (Fig. 22).



Sea-breeze. Day.

Fig. 21.



Land-breeze. Night.

Fig. 22.

Land-breezes and sea-breezes are strongest on tropical mountainous coasts and islands, but may be observed in higher latitudes during calm weather. They may of course be masked by some strong constant wind, *e.g.* a trade-wind. In such cases what is observed is a daily alternate strengthening and reduction of the prevailing wind. Thus in the region of the north-east trade-winds a mountainous coast facing north-east would strengthen the trade-wind during the day and reduce it at night; while on a south-west coast in the same region exactly the reverse would take place.

Monsoons.

38. Monsoons are essentially land and sea-breezes on a large scale, but with a period of a year instead of a day. The word "monsoon" is Indian—the monsoons of India, Indo-China, and China are far stronger and more important than those of any other part of the world; but monsoon effects are found to a less extent in all the continents other than Asia.

In the northern summer the high plateaus of central Asia are intensely heated, and become therefore a centre of low pressure, with winds flowing in from every side. The "Heat Equator," in fact, which on the oceans is never very far from the geographical equator, is in summer moved far to the northward by the land-mass of central Asia, with its enormous extent and great elevation. This forms, as it were, a gigantic flue, the suction of which draws the south-east trade-winds across the equator, where they are deflected in accordance with Buys-Ballot's rule. Hence south-west winds blow from May to September over the Arabian Sea and the Bay of Bengal, and right across India to the Himalayas.

Meeting successively two high mountain barriers—the Western Ghats in southern India and the much higher Himalayas in the north—this **summer monsoon** is forced upward into a cooler region, and hence deposits a heavy rainfall (over 80 inches) on the windward slopes of these mountains and on the plains lying at their feet.

In Indo-China and China, during the same season, the low pressure prevailing over central Asia deflects the north-east trade-winds of the western Pacific, and draws them inland as a south-east monsoon of somewhat less strength than the south-west monsoon of India.

39. In winter the plateaus of central Asia become a centre of intense cold and **high pressure,** with outflowing winds. At the same time the sun is vertical over northern Australia, and makes that island a centre of heat and **low pressure.** The "heat equator," in fact, has moved from Cancer to Capricorn, and the effects of the summer monsoon are almost precisely reversed.

The **winter monsoon** of Asia blows from the north-east in India and Indo-China, and from the north and north-west in northern China and Japan. It is almost everywhere a **dry** wind, but in crossing the Bay of Bengal and the South China Sea it picks up sufficient moisture to produce abundant rainfall in the extreme south of India, Ceylon, the southern extremity of the Malay Peninsula, and the adjacent islands, which, lying in the equatorial belt, receive rain at all seasons.

The north-east monsoon is drawn across the equator by the low pressure in Australia, and blows as a **north-west** monsoon in the north of that continent, the wet season there coinciding almost precisely with the dry season in south-eastern Asia.

The severe storms (**typhoons**) of the India and China seas occur principally during the gradual change from the winter to the summer monsoon, or *vice versa*, when the atmosphere is in an unstable condition. These storms are local **cyclonic** disturbances (*v.* Chap. IV.).

Typhoons are especially common in the **China Sea** from August to November. They have occasionally done enormous damage to shipping, even in harbours usually safe, *e.g.* Singapore and Hong Kong.

40. The **monsoon effects** of other continents are not nearly so obvious or important as those of Asia, owing to their smaller area and smaller variations in temperature. But it may be noted that (1) on the eastern side of continents and large islands in the trade-wind latitudes the winds are stronger (and therefore the rainfall heavier) in summer than in winter (cf. land and sea breezes). (2) The low temperature and high pressure of North America in winter reinforce the prevailing westerly winds of the North Atlantic, north of Lat. 40° N., which are much stronger and more constant in winter than in summer. It is only in spring and early summer that east winds are at all common in England.

The Föhn.

41. In ascending a lofty mountain range a surface wind moves into a region of less pressure. It thus expands, and in expanding it loses much of its heat (about 1° C. for every 180 feet of ascent). As a result of this it deposits nearly all its moisture on the windward side of the mountain range, and passes the summit thoroughly dry. Such a wind may pass out of the surface circulation of the atmosphere altogether, but when the barometer is low on the other side of the mountains the air is often drawn down the leeward slope and becomes heated by contraction in descending.

The hot dry wind so produced is an important phenomenon in the northern valleys of the Alps, where it is called the **Föhn**, and in some eastern valleys of the Rocky Mountains, where it is called **Chinook**. It melts snow very rapidly, and tends to equalise the climate of the valleys, which would otherwise be colder and more extreme. The Swiss Föhn was once thought to come from the Sahara, but it is of purely local origin.

CHAPTER III.

OCEANS AND SEAS.

Land and Water.

42. Until the polar regions have been more thoroughly explored, it is impossible to estimate accurately the proportions of sea and land on the earth's surface. So far as is known, however, about 72 per cent. of the surface is covered with water.

By far the greater part of the land lies in the northern hemisphere, as any map of the world shows us at a glance. South of lat. 40° S. there is no land at all, except the narrow extremity of South America, part of New Zealand, Tasmania, and other smaller islands, and the unexplored "Antarctic Continent," which is almost wholly within the Antarctic Circle.

Thus between 40° S. and 66½° S. there is an almost uninterrupted sheet of water all round the earth. This is now generally called the **Southern Ocean.**

A hemisphere which has its centre near the south of England contains about seven-eighths of all the land; in this "**land hemisphere**" land and water are almost equal in area. In the "**water hemisphere,**" which has its centre near New Zealand, the area of the land is less than one-tenth of that of the water.

I.—Extent and Distribution.

43. The oceans form one connected expanse of water, which is, however, divided for convenience into four parts. (1) The Southern Ocean has been already defined above. Northwards of the assumed boundary of this are (2) the long and comparatively narrow **Atlantic Ocean**, the ocean of greatest historical significance and commercial importance; (3) the **Pacific Ocean** or Great Ocean, which alone has an area greater than that of all the land of the globe; (4) the roughly semicircular **Indian Ocean**, between Africa, Asia, and Australia. By far the greater part of this lies south of the equator.

Geographers formerly considered the Arctic as a separate ocean, the smallest of five. The modern tendency, however, is to regard the Arctic merely as a partially enclosed sea of the Atlantic.

44. The **Atlantic Ocean** is much smaller than the Pacific, but is far more important, being the great highway of nations, and having on or near its shores all the most important commercial ports of the world.

Its area is about 33,000,000 square miles. It is enclosed by a very broken coast line, the chief indentations being the Baltic Sea and the Mediterranean Sea on the eastern side, the "Arctic Ocean" on the north, and Baffin's Bay, Hudson Bay, the Gulf of Mexico, and the Caribbean Sea on the western side.

Most of the large rivers of the world flow into the Atlantic or its connected seas and bays. In fact, the Atlantic receives the drainage of more than half the land of the globe.

The **Pacific Ocean** covers about 55,000,000 square miles. It has few large inland seas opening from it, and it does not receive many great rivers. The Yellow Sea, the China Sea, and the Sea of Japan are the most important of its subsidiary seas, and the rivers of China the only important rivers.

This ocean contains, however, very many islands, some of them large and important, whereas in the Atlantic there are comparatively few islands.

The **Indian Ocean** has an area of about 17,000,000 square miles, or about half that of the Atlantic. It includes very important islands and groups of islands, and receives the drainage of several of the great rivers of Asia.

II.—Depths of Oceans.

45. The average depth of the oceans is about 11,500 feet, just five times the average height of land above sea-level. The greatest depth so far measured is one of 31,614 feet, near the island of Guam, one of the Ladrone group, in the western Pacific. Several other soundings of over 30,000 feet have been obtained in the Pacific, but not in any other ocean. The greatest depth measured in the Atlantic is 27,360 feet, at a point a little north of Porto Rico.

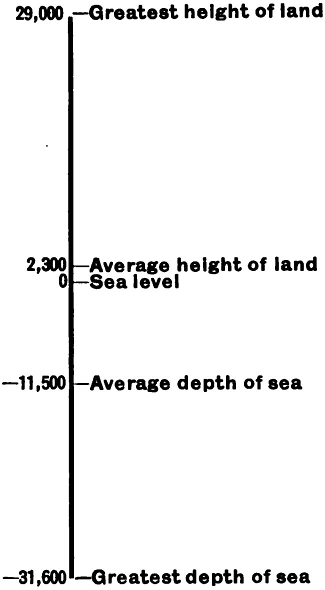


Fig. 23.

Fig. 23 illustrates the relative magnitudes of height of land and depth of sea. It will be seen that between the highest peak and the lowest deep there is a vertical difference of more than 60,000 feet, or about 11½ miles. The average level of the solid globe is nearly 10,000 feet below sea-level, so that all the continents may in a certain sense be regarded as high plateaus with their lower slopes submerged.

III.—Continental Shelf.

46. The **Continental Shelf** is the area covered by relatively shallow water (less than 100 fathoms deep) which surrounds the coasts of the world, and is a submerged margin of the continents. On its outward edge the shelf usually ends in a relatively steep slope descending into deep water—2,000 to 3,000 fathoms.

Generally where the land near the coast consists of low undulating plains, the continental shelf is wide; where a mountain range borders the coast, the shelf is usually narrow.

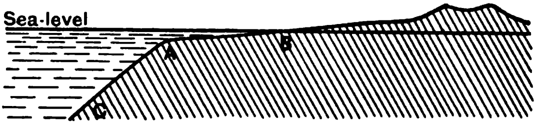


Fig. 24.

WIDE CONTINENTAL SHELF BORDERED BY PLAINS.

Figs. 24 and 25 show typical profiles of a continent-margin in the two above-mentioned cases: *AB* is the continental shelf and *AC* is called the continental slope; in both figures the slopes are very much exaggerated.

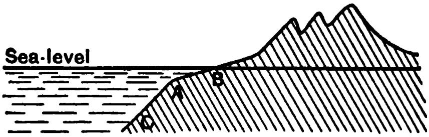


Fig. 25.

NARROW CONTINENTAL SHELF BORDERED BY MOUNTAINS.

The continental shelf is widest off the north-west of Europe, where the British Isles stand on it, and it includes the whole of the North Sea and the Baltic; off the south-east of South America, where it stretches beyond the Falkland Islands; to the north of Australia, where it stretches to New Guinea; off the south-east of Asia; and round the peninsula of Florida. The whole of Hudson Bay is also covered by shallow water.

IV.—The Floor of the Ocean.

(1) Configuration.

47. The bottom of the ocean consists for the most part of vast, monotonous, nearly level plains, diversified in places by long ridges and occasional isolated peaks rising nearly or quite to the surface.

The configuration of the Atlantic basin well illustrates the fact that the deepest parts of the ocean are found relatively near land. A long ridge, rising from below 3,000 fathoms to about 1,200 fathoms, extends through the centre of the Atlantic from north to south, roughly in the shape of a letter S. The northern part of it is called the **Dolphin Ridge**, the southern part the Challenger Plateau, and the two are joined across the equator by the Connecting Plateau.

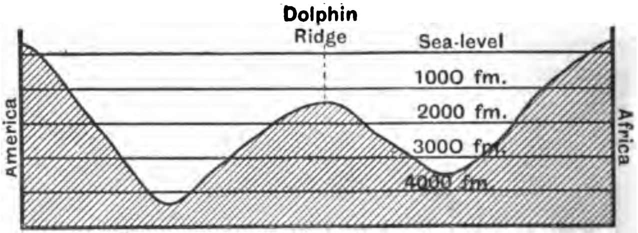


Fig. 26.

SECTION OF THE NORTH ATLANTIC FROM EAST TO WEST.

On each side of the central ridge are two "deeps," respectively north and south of the equator, the western ones being somewhat deeper than those on the east (Fig. 26). Ascension Island and the Azores are islands rising from the central ridge; the Bermudas, St. Helena, and the Cape Verde Islands are volcanic peaks rising from much greater depths; the Canary Isles are on the continental slope of Africa; the West Indies are the projecting summits of a long curved ridge extending from Yucatan to the delta of the Orinoco.

In the North Atlantic another ridge (the Wyville-Thomson Ridge) joins Norway and the British Isles to the Faroe Islands, Iceland, and Greenland, and separates the Atlantic from the deep circular basin of the Arctic. The Mediterranean Sea, the Caribbean Sea, and the Gulf of Mexico are all deep; but in each case they are nearly shut off from the main ocean by a ridge or "sill" rising nearly to the surface.

The **Pacific** basin has been much less thoroughly explored than the Atlantic. It appears to consist of one great hollow from America to Asia, broken up in the south and west by many ridges and peaks which form the innumerable islands of Oceania. On the east or American side the sea-floor rises very steeply, the continental shelf being very narrow or almost non-existent; while on the west side the Japanese and Philippine Islands also rise abruptly out of deep water, and really represent the true coast-line of Asia. The **Tuscarora deep** (27,930 feet), a little east of Japan, was, until recently, the deepest known part of any ocean.

(2) *Composition.*

48. In shallow water, down to about 100 fathoms, the sea-floor consists of sand, gravel, and mud, the composition of which depends on that of the neighbouring land, as these terrigenous deposits are the result of denudation of the land by rain and rivers and the direct action of the sea on the coast.

Large rivers deposit enormous quantities of very fine mud over areas extending in some cases hundreds of miles from their mouths. This mud is generally of a slaty-blue colour, but green and red muds are also found.

49. In deeper water, beyond the reach of any direct influence from the land, the sea-floor is mainly composed of remains of marine organisms and of the products of volcanic eruptions. The deposits which cover the greatest area are called **Globigerina Ooze** and **Red Clay.**

The former is largely composed of shells of minute animals, mainly foraminifera, and its chief constituent is calcium carbonate (chalk), mixed with volcanic minerals.

Red Clay covers the deepest parts of the ocean-floor over an immense area. It consists mainly of the silicious remains of shells similar to those which form Globigerina Ooze. Very deep water, containing a good deal of carbonic acid, dissolves the chalky portions of the shells, and the remainder falls to the bottom and forms the Red Clay, consisting chiefly of aluminium silicate, coloured red by oxide of iron.

Meteoric fragments, water-logged pumice, and shark's teeth are frequently found in the Red Clay, and are evidence of the extreme slowness of its formation, as, if the formation were rapid, they would be soon covered up. The fact that no rocks, that could have been produced by the consolidation of the Red Clay, have been found in any of the continents, is evidence of the permanence of the great oceanic depths throughout the time during which the sedimentary rocks were laid down.

V.—The Water of the Ocean.

(1) Composition.

50. Sea-water contains on an average about three and a half per cent. of dissolved solids, of which nearly four-fifths is sodium chloride, or common salt. Magnesium chloride, magnesium sulphate, and smaller quantities of many other salts are also present. Owing to the salts it holds in solution, sea-water is denser than fresh water, and freezes at a lower temperature, about 28° F., *i.e.* 4° F. below the freezing-point of pure water.

(2) Salinity.

51. The **Salinity** of sea-water means the proportion of dissolved solids contained in the water, and is usually expressed as a percentage. The average salinity of the oceans is about 3·5, *i.e.* 100 lbs. of sea-water contain 3·5 lbs. of dissolved salts. The density of sea-water depends on two factors, its salinity and its temperature. The density increases with salinity, but, owing to expansion of the water, decreases with rise of temperature. The heat of the sun, apart from its indirect action in producing winds, acts on the sea in two ways: (*a*) it raises the temperature, and so diminishes the density of the water; (*b*) by promoting evaporation it increases the salinity, and so raises the density.

Owing to the heavy equatorial rains, the equatorial belt of very warm water is, in the open oceans, less saline than the ocean-water in the trade-wind zones. In the latter there is little rain and much evaporation. The winds, blowing into warmer latitudes, are able to absorb more and more water from the sea as they approach the equator, and hence the salinity is greater than the average. In higher latitudes the sea is again less salt, owing to less evaporation, more rain, and melting ice.

(*3*) *Temperature.*

52. At great depths (below about 5,000 feet) the temperature of all the oceans in all latitudes is about the same, *i.e.* usually two or three degrees above the freezing-point of fresh water. The surface water naturally varies very greatly in temperature, from about 90° F. in enclosed tropical seas to about 28° F. in the polar seas.

In the open oceans, in warm climates, there is at first a rapid decrease of temperature from the surface downwards, and then a slow decrease to the bottom. But in nearly enclosed seas like the Gulf of Mexico, the Mediterranean, and the Red Sea, which have at their entrances a "sill" or barrier not very far below the surface, the decrease in temperature continues only down to the level of the barrier, and below that the temperature of the enclosed basin remains the same right down to the bottom. This is because the cold water of the open ocean, being denser than that which lies above it, cannot surmount the barrier and flow into the enclosed sea.

Fig. 27 shows a section (not drawn to scale) of the barrier across the Strait of Gibraltar, about 1,100 feet below sea-level. The temperature at the surface is about 65°. At the level of the barrier it is about 55°, and on the Mediterranean side the temperature remains at 55° right down to the bottom (14,000 feet), whereas the open Atlantic at the same depth is 20° colder.

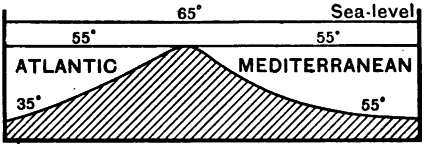


Fig. 27.

VI.—Movements of the Ocean.

Ocean Currents.

53. When any body of water is heated in one place and cooled in another, differences of density are produced which set up convection currents. In the ocean there is a slow general circulation due to the settling of cold dense water to the bottom in the polar seas. This cold water flows along the bottom towards the equator, where it slowly rises, getting warm at the surface and flowing again towards the poles. Thus even the deepest parts of the ocean are not stagnant; if they were they could not continue to support the animal life that is found even at the greatest depths. Deep-sea organisms depend for their life on oxygen dissolved in the water, and this would soon be exhausted if the water were not in circulation.

The above-described general movement is, however, extremely slow—so slow that there is no direct evidence to prove its existence. It has no relation to the much more rapid surface currents, which are important in connection with navigation, and still more, perhaps, in their effects on climate.

54. If a chart of ocean currents be compared with a chart of prevalent winds, it will be seen that there is a very considerable similarity between the two. In fact, the chief surface currents of the oceans appear to owe their origin, directly or indirectly, to the prevailing winds, though there are many local variations owing to the deflection of currents by coast-lines.

Roughly, however, the circulation of the Atlantic, Pacific, and Indian Oceans takes the form, in each case, of two great eddies of water, one north and the other south of the equator; the northern one being in a clockwise direction, and the southern one counter-clockwise. In the Southern Ocean, under the influence of the Brave West Winds, there is a continuous eastward drift of water all round the World.

In partially enclosed shallow seas, such as the North Sea, the circulation of the water is controlled to a large extent by tides (§§ 60-62).

Currents of the Atlantic.

55. The trade winds of the Atlantic, north and south of the equator, drive before them two westward currents, the **North Equatorial** and the **South Equatorial**. Between them, and in the opposite direction, flows a narrow counter-current, probably due to the heaping up of water on the north-east coast of South America by the two eastward currents.

The counter-current, after flowing round the Gulf of Guinea as a stream of hot, and comparatively fresh, water, merges again into the South Equatorial.

The latter, on meeting the coast of South America, divides into two parts. One part flows south as the warm **Brazil Current** till it gets into the latitude of the west winds and is driven eastward again to the coast of Africa; then, flowing northwards as the cool **Benguela Current**, it rejoins the South Equatorial.

The other part of the South Equatorial Current flows through the Caribbean Sea into the Gulf of Mexico. The

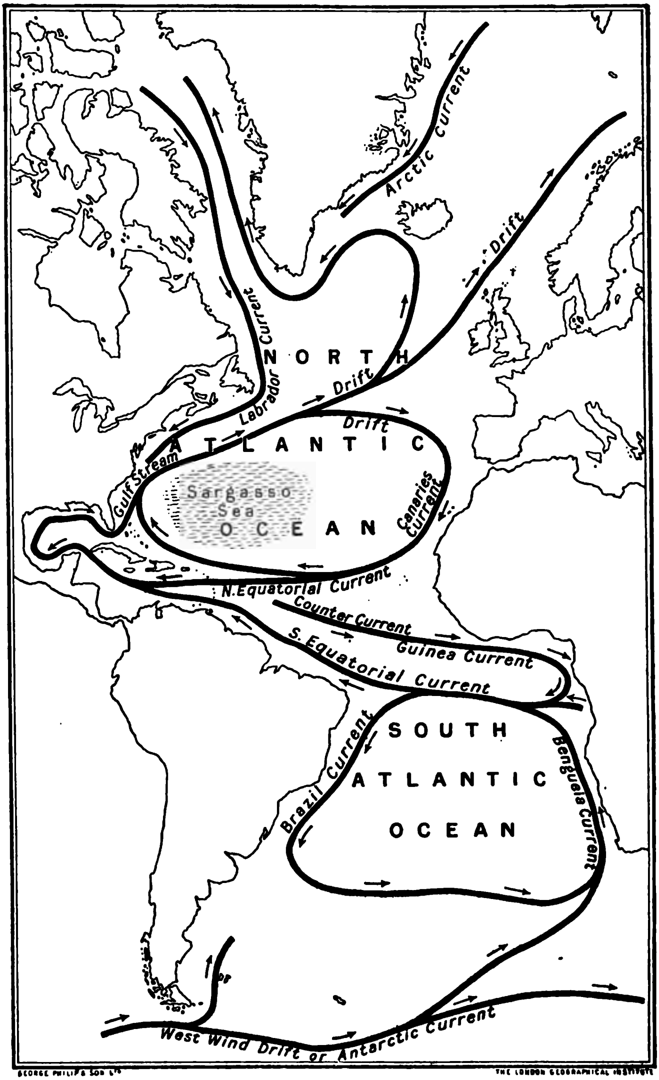


Fig. 28.—Currents of the Atlantic Ocean.

North Equatorial Current also flows partly into the Caribbean Sea, but most of it is deflected to the right, in accordance with Buys-Ballot's Law, and flows along the east coast of the United States, reinforcing the Gulf Stream.

The level of the Gulf of Mexico is raised by the warm water which enters it from the south. The surplus water flows out through the Strait of Florida as the **Gulf Stream,** a deep wide current of warm water flowing at the rate of about five miles an hour.

The Gulf Stream turns sharply to the north just outside the Strait, and flows parallel to the coast, gradually becoming wider, shallower, and cooler, till finally, moving into the belt of westerly winds, it disappears as a definite current, and merges into the general **North Atlantic Drift** towards the shores of Europe.

Off the coast of Spain part of the North Atlantic Drift turns southward and rejoins the North Equatorial Current. Most of the remainder goes north-eastward past the British Isles and along the coast of Norway; a small portion is diverted to the southern coast of Iceland. The continual drift of warm water from the tropics towards Europe gives to the north-western part of that continent a climate of very exceptional mildness.

56. The most important polar current of the Atlantic is the **Labrador Current,** which flows out of Baffin Bay along the coast of Labrador, carrying many icebergs. It meets the Gulf Stream near Newfoundland, where the meeting of warm and cold water produces the fogs which are so frequent in that region. The cold current continues further south between the United States coast and the Gulf Stream, and is known as the "Cold Wall." It disappears near Cape Hatteras, apparently sinking beneath the warmer water round it.

In the centre of the great whirl of water flowing round the North Atlantic is a large area known as the *Sargasso Sea,* where there is comparative rest, and where immense quantities of floating sea-weed (*Sargassum*) accumulate.

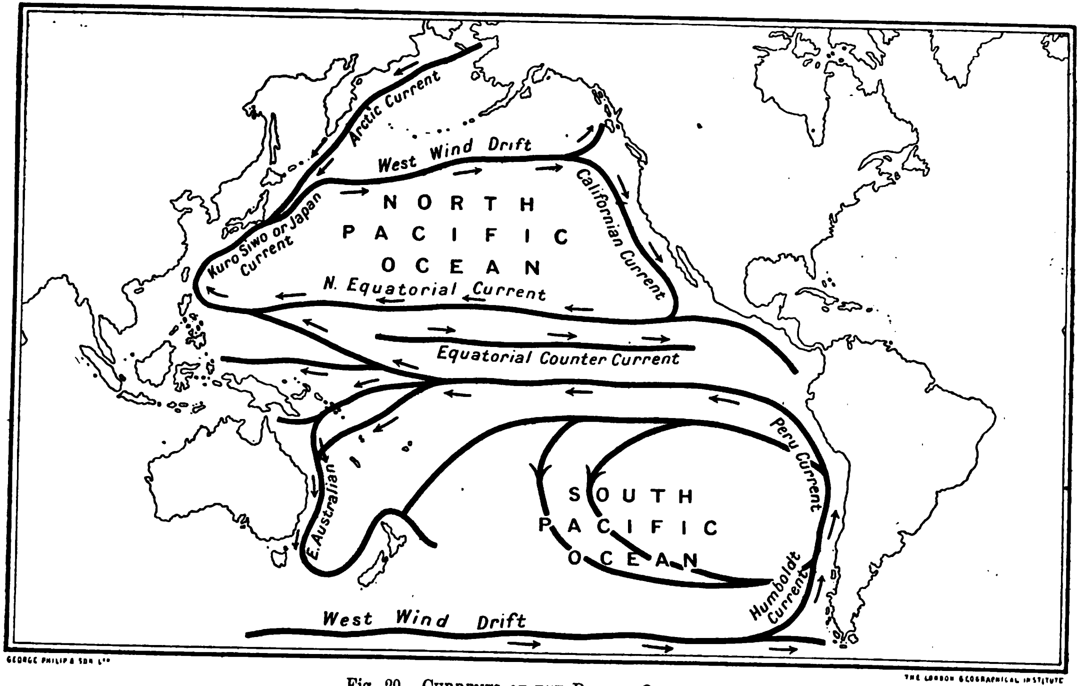


Fig. 29.—CURRENTS OF THE PACIFIC OCEAN.

Currents of the Pacific.

57. The circulation of the Pacific Ocean is very similar to that of the Atlantic, though, of course, on a larger scale. Thus in the north temperate zone the general **West Wind Drift** makes the western slope of North America much warmer than the coast of China in corresponding latitudes.

In the South Pacific the cool **Humboldt Current** flowing northward along the coast of South America corresponds exactly to the Benguela Current off the coast of Africa, and the result is that in both continents the west coast is considerably cooler than the east.

In the Pacific Ocean seasonal variations of currents are of more importance than they are in the Atlantic, owing to the monsoon winds (see Ch. II.) of Indo-China, and the west coast of Central America. In the latter region the drift is always parallel to the coast, and is from the north-west during winter, and from the south-east during summer.

In the western Pacific the South China Sea acts very much the same part as that played by the Gulf of Mexico in the Atlantic. But in winter, under the influence of the north-east monsoon, its water pours through the Strait of Malacca, and other openings, into the Indian Ocean. In summer, during the south-west monsoon, the hot water of the China Sea passes out between the Philippines and Formosa, and goes north-eastward past Japan, where it is called **Kuro Siwo**, or the Black Stream. It finally merges into the general West Wind Drift, which gives to British Columbia and California an abnormally mild winter climate. Corresponding to the "Cold Wall" of the United States, there is an Arctic Current between Japan and the Kuro Siwo.

Currents of the Indian Ocean.

58. In the southern Indian Ocean the circulation is almost precisely similar to that of the South Atlantic and the South Pacific.

A cool current flows northward along the west coast of Australia (corresponding to the Benguela and Humboldt

Currents), and then, turning westward, reaches Africa as a hot South Equatorial Current, and flows southward along both sides of Madagascar, turning eastward again off Cape Agulhas, under the influence of the west winds.

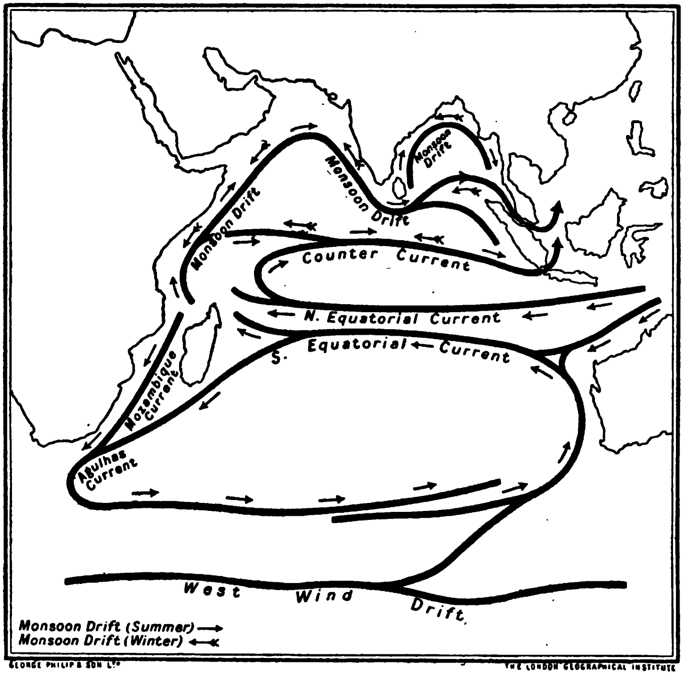


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Fig. 30.—Currents of the Indian Ocean.

North of the equator the circulation of the Indian Ocean is determined by the monsoons. In winter the north-east monsoon drives the water in a counter-clockwise direction round the Bay of Bengal and the Arabian Sea, while an eastward counter-current flows along the equator. In summer these conditions are reversed by the south-west monsoon, and the water north of the equator circulates in a clockwise direction.

Circulation in Enclosed Seas.

59. In nearly enclosed seas, such as the Mediterranean and the Baltic, the movements of the water are determined by local conditions, and are quite independent of the general circulation of the oceans.

The **Mediterranean** is considerably more salt than the open oceans. The rivers which flow into it are not sufficient to counterbalance the great evaporation that is continually lowering the surface. Thus the level of the Atlantic is higher than that of the Mediterranean, and hence a current of fresher water flows in through the Strait of Gibraltar. Beneath this inflowing current, however, is an outward current of dense salt water, caused by the increased pressure inside due to the inflowing current. If it were not for the deep under-current the salinity of the Mediterranean would continually increase.

There are two similar in- and out-currents between the Mediterranean and the **Black Sea.** In the latter sea the rivers more than compensate for the evaporation, and thus the level of the Black Sea is raised while that of the Mediterranean is lowered. Hence there is produced a surface current of comparatively fresh water into the Mediterranean, with a reverse current of very salt water underneath. But for this under-current the Black Sea would be permanently freshened by the great rivers flowing into it.

The circulation of the **Red Sea** is precisely similar to that of the Mediterranean, except that it has only one entrance instead of two. (The Suez Canal does not affect the circulation.)

The case of the **Baltic** is similar to that of the Black Sea. Its rivers are so numerous that the surface water is comparatively fresh; and this explains the exceptional readiness with which the Baltic freezes in winter. If it were as salt as the Mediterranean it would probably never freeze.

VII.—Tides.

60. The tides are waves produced mainly by the gravitational attraction of the moon on the earth. That side of the earth nearer the moon is attracted with a greater force than the side further away. The solid portion of the globe is not, owing to its rigidity, perceptibly affected by this difference in force; but its liquid covering is deformed, the water being heaped up in two waves on opposite sides of the earth, while midway between these are troughs or spaces of low water.

The attractive force exerted by the moon varies inversely as the square of the distance between the moon and the body attracted. The attraction on the *solid* part of the globe is the same as if the whole were concentrated at the centre of the globe. Thus the water on the side nearest the moon experiences a greater force than the solid portion and is therefore drawn away from the earth. Similarly the solid portion experiences a greater force than the water on the side farther away from the moon and is therefore drawn away from that water. In this way there are formed two high tides at the same time on opposite sides of the earth.

The crests of the double wave follow the apparent movement of the moon round the earth once in about 25 hours, so that at every place high and low water succeed each other at intervals of about 6¼ hours.

The sun has similarly a tide-raising effect; but the moon, though it is much smaller than the sun, is so much nearer the earth that its tide-raising effect is nearly three times as great as that of the sun. Hence the solar tides have no independent existence, but either reinforce or diminish the lunar tides, according to the phases of the moon.

At "Full and Change," *i.e.* at full moon and new moon, the sun, moon, and earth lie nearly in a straight line (Fig. 31*a*), and hence the solar and the lunar tides coincide, and the "tidal range," or difference between high and low water, is greater than the average. These unusually high tides are known as **spring tides.**

When the moon is in its first and third quarter, the attractions of the sun and moon act on the earth at right angles to each other (Fig. 31*b*). The trough of the solar tide coincides with the crest of the lunar tide, and the resultant tidal range is less than the average. Tides occurring at these periods are known as **neap tides.*** (In Figs. 31*a* and 31*b* the distortions of the oceans are enormously exaggerated.)

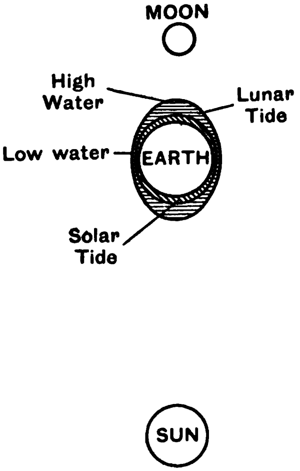

Fig. 31 *a*.

SPRING TIDES AT FULL MOON.

(The same results are produced at new moon, when the moon is nearly between earth and sun.)

61. On the open oceans the tidal range is very small, only two or three feet, and no perceptible currents are produced, the movement of the water being merely up and down. In enclosed seas with narrow openings, such as the Mediterranean, there is hardly any tide at all—a fact of great importance in the early development of navigation.

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* The theory of the tides is very complex. It must not be supposed that the above is anything like a complete explanation.

In shallow partially enclosed seas, however, and especially round the British Isles, tides produce definite rapid currents, which are of considerable importance. When an oceanic tidal movement, which on the equator is at the rate of 1,000 miles an hour, reaches shallow water at the edge of the continental shelf, its speed is suddenly checked, and the wave increases in amplitude or height, as any wave does when retarded. The Atlantic tidal wave, as it approaches British shores, has its rate of progression reduced to less than 100 miles an hour.

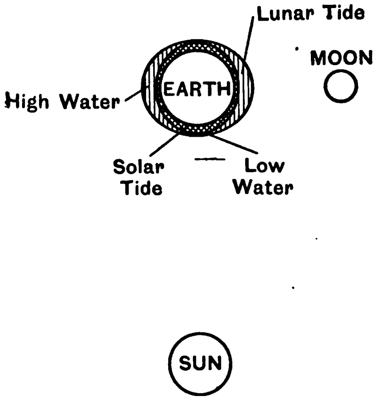

Fig. 31 *b*.

NEAP TIDES AT HALF MOON.

The Atlantic wave, reaching the west of Ireland, flows round both ends of that island, and currents moving from two to four miles an hour sweep into the Irish Sea from both north and south, while another portion of the Atlantic wave advances eastward up the English Channel, increasing in height owing to the lessening width of the Channel.

The crest of the Channel tidal wave reaches Dover in about six hours after passing Land's End, and at the same time the crests of the two tidal waves in the Irish Sea meet off the mouth of the Mersey. Thus Dover and Liverpool have high water at the same hour.

While the tide is rising at these two ports, the Atlantic wave rounds the north of Scotland, and produces a southward current in the North Sea. The crest of the North Sea tidal wave takes more than twelve hours in passing along the eastern shore of Great Britain, and it meets the next following high tide near the Straits of Dover.

When the tide is falling at Dover and at Liverpool all the above-mentioned currents are approximately reversed.

Southampton has the very distinct advantage, from the mariner's point of view, of having four tides a day, instead of the usual two. When high water, moving up the English Channel, reaches the Needles, part of the current passes up the Solent into Southampton Water, giving high tide there. About two hours later, when this tide is receding, the main tidal wave of the Channel has rounded the other end of the Isle of Wight, and a current flows up Spithead to Southampton, producing another high tide there.

62. Tides reach their greatest height in funnel-shaped bays and estuaries, where the water rapidly gets shallower. The greatest tidal range known is in the Bay of Fundy, Nova Scotia, where spring tides occasionally reach a height of 70 feet above low water. The highest tides on the shores of Britain are in the Bristol Channel, where spring tides have a range of about 40 feet at the mouth of the Bristol Avon. On the other hand, where a narrow entrance leads into a bottle-shaped opening, as in the Mersey and at Portsmouth Harbour, the tidal range inside is naturally not as great as that outside. In these cases the strong currents through the neck of the bottle tend to sweep it clear of sediment, and so keep a deep channel open.

63. The tidal current sometimes advances far up rivers as a distinct wave stretching right across the stream, and known as a **bore**. It is seen in England on the Severn and the Trent; and abroad on the Amazon and the Yang-tse-Kiang.

A tidal "race," or very rapid current, is often produced among groups of islands, or through narrow straits, by differences in the time of high water, or in the tidal range, on opposite sides of the opening. Thus in the Pentland Firth there is a difference of about an hour between the times of high water on opposite sides of the strait, and currents at the rate of six to eight miles an hour run alternately to and fro through the channel.

CHAPTER IV.

WEATHER AND CLIMATE.

64. Weather is "the condition of the atmosphere at any moment with regard to wind, temperature, cloud, moisture, precipitation, etc." *

The **climate** of a place may be defined as the **average** condition of the weather at that place. The climate of a place depends chiefly on the following factors: (1) latitude, (2) elevation, (3) distance from the sea, (4) ocean currents, (5) prevailing winds, (6) land-relief, especially the position and direction of mountain chains.

(*1*) *Latitude.*

65. The **Latitude** of a place determines its seasons and the duration of daylight at different times of the year. The difference in length between the longest and the shortest day increases with latitude. Hence, other things being equal, the higher the latitude of a place, the greater will be the difference between summer and winter there.

The total duration of daylight for a year is the same in all parts of the earth; but generally speaking the further a place is from the equator the less is its average temperature. This is due to the fact that in high latitudes sunlight falls more obliquely on the earth than it does between the tropics, where the sun at midday is nearly or quite vertical.

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* Marriott: *Some Facts about the Weather.*

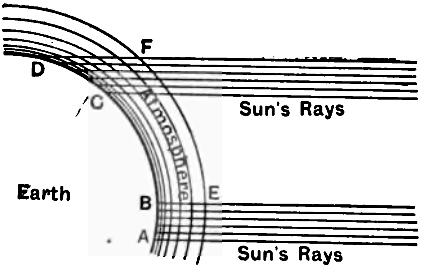

Fig. 32.

Fig. 32 represents two beams of solar rays, of equal dimensions, falling on the tropical area AB and on the area CD in a high latitude. The amount of heat concentrated on AB is the same as the amount spread out over the much larger area CD; also less heat is absorbed by the air between E and B than in the deeper layer FD.

(2) *Elevation.*

66. As the height above sea-level increases the average temperature diminishes at the rate of about 1° F. for every 300 ft. of vertical height. This is because air is only very slightly heated by the direct rays of the sun, and gets nearly all its heat by conduction from the ground. Also, in the purer and more rarefied air of mountain regions, radiation of heat into space is much more rapid than at lower levels; so that though a mountain slope may get quite hot during the day, it will cool very rapidly at night. The **snow-line**, or line above which snow does not melt, is about 16,000 feet high at the equator, 9,000 feet high in Switzerland, and descends to sea-level in Spitzbergen.

(3) *Influence of the Sea.*

67. The proximity of a place to the sea probably does not affect much the *average* temperature for a year, but has a great equalising effect, making winters warmer and summers cooler than they are in the interiors of continents. As already mentioned, the sea does not vary in temperature nearly so much as the land does, owing partly to its free circulation and partly to its high specific heat. Hence we find that places far from the sea, or those shut off from the sea by high mountains, have extreme or **continental** climates, with a great range of temperature between summer and winter; while small islands and the coasts of continents have **insular** or **oceanic** climates, with a much smaller range of temperature.

Special circumstances may give a sea-coast a climate of the continental type. This occurs in the north-eastern United States and on the east coast of Asia in the same latitude, and is in both cases due to prevailing off-shore winds and cold currents. On the other hand, the moderating influence of the sea may travel inland many hundreds of miles over flat river-basins like that of the Amazon.

In Moscow and Winnipeg, and generally in the interior of the northern continents, the difference between the average temperatures of January and July is more than 50°; while in such regions as British Columbia, Florida, and the south-west of England the difference is less than 20°.

(4) *Ocean Currents.*

68. Ocean currents act only indirectly on land climates by altering the temperature of the air which blows over them. The cool currents from the south make the west coasts of South America, Central and South Africa, and Australia appreciably cooler that the east coasts. The influence of the warm west wind drift on the climate of western Europe and western North America has been already referred to (§§ 55-7).

(5) *Prevailing Winds.*

69. Prevailing winds exercise a very important influence both on temperature and on rainfall. An on-shore wind is usually associated with a mild equable climate and an abundant rainfall; off-shore winds produce a dry, rather cool climate. The effects of wind on climate will be illustrated by many examples later on.

(6) *Mountains.*

70. Mountains, especially when in the form of continuous ranges, produce very important differences of climate. When near the coast they act as barriers, preventing the moderating influence of the sea from spreading inland. When there is an on-shore wind the windward slope of the mountains gets a very heavy rainfall (see Chapter II.). The influence of mountains on rainfall commences a long distance from their actual slopes, but becomes greater as these are approached. Thus the rainfall of the upper Amazon, near the Andes, is greater than that of the lower valley; the rainfall of Manchester, near the Pennine Range, is greater than that of Liverpool.

Mountains affect also the temperatures of places by shielding them from cold or warm winds. The climate of northern Italy and southern France owes its winter warmth to the protecting barrier of the Alps.

ISOTHERMS.

71. The distribution of temperature on the earth's surface is most conveniently studied by drawing on a map lines joining places which have *the same average temperature* for a given period of time. Such lines are called **isotherms.**

As seasonal changes of temperature are usually more important than annual averages, separate maps are constructed, showing isotherms for January and for July, the two months which as a rule exhibit the greatest extremes of temperature.

It is obvious that, as temperature decreases north and south of the equator, the isotherms have, on the whole, an east and west direction round the world. They are, however, irregular in form, owing to ocean currents and the greater variability in temperature of the land as compared with the sea. The irregularities are naturally greater in the northern hemisphere, where land preponderates. It is impossible to give in reasonable compass any verbal account of the isotherms of the world; they must be studied on maps. Some attempt will be made, however, to indicate the most striking points.

The important fact should first be noted that isothermal charts are constructed from readings of temperature **reduced to sea-level**, so that they do not show local differences of temperature due to elevation. The isotherm of 90° in July forms a ring round the Himalayas, but encloses hundreds of square miles where the average temperature, owing to great elevation, is below 32°. The actual average temperature of a place may be obtained from an isothermal chart by finding what isotherm passes through the place, and then subtracting from the temperature indicated by the isotherm 1° for every 300 feet of elevation.

January Isotherms.

72. As January is midsummer in the southern hemisphere, the highest temperatures occur in south central Africa and in northern Australia, in each of which the isotherm of 90° is a closed ring, forming a "pole" of maximum heat. South America in the same latitudes is not so hot, being much more open to the influence of the sea.

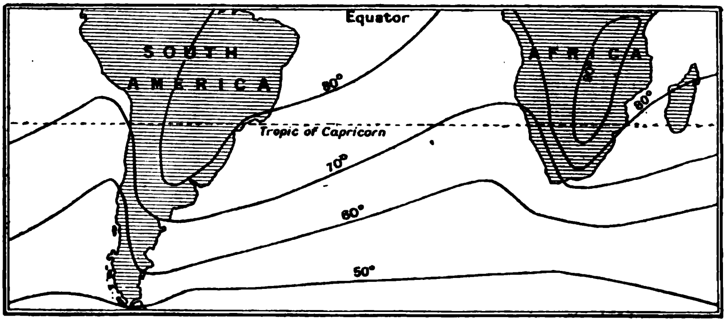

Fig. 33.

JANUARY ISOTHERMS.

The southern isotherm of 70° lies along the south coast of Australia, passes just north of New Zealand, and off South America, owing to the cool Humboldt current, is bent further north, beyond the tropic of Capricorn. In crossing South America, however, it is bent again to the south through nearly 20° of latitude, the Humboldt current having no influence beyond the narrow Pacific slope of the continent.

In Africa the same phenomena are repeated : the isotherm turns northward under the influence of the Benguela current, and then southward on the heated land. The courses of several southern isotherms are shown in Fig. 33. The isotherm of 32° in January coincides almost exactly with the Antarctic Circle.

73. Turning to the northern hemisphere in January, we find "**poles**" of **maximum** cold in the far north of Asia and of North America. The former is round the Siberian village of Verkhoyansk, which has a mean January temperature of — 60°, and is the coldest inhabited place on the earth.

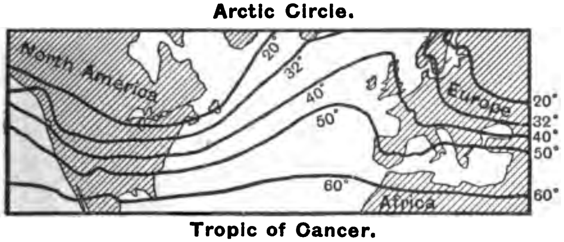

Fig. 34.

JANUARY ISOTHERMS.

The isotherm of 32° (Fig. 34), crossing the Pacific about lat. 55° N., turns southward in North America, passes considerably to the south of the Great Lakes, and reaches the Atlantic near New York. It is swung northward by the great Gulf Stream Drift, touches Iceland, and reaches nearly to the north of Norway. There the cold land turns it sharply southward through central Germany and Austria, across the Black Sea and the Caspian, and then eastward across Asia to northern Japan.

The other northern isotherms follow similar courses—crowded together and bent southward in America, and spread out fanwise on the coast of Europe. The isotherm of 40°, which runs through the middle United States, passes also round the north of Scotland, 20° further north. The isotherm of 70° is more regular in form, and coincides very nearly with 20° N. latitude, but over the Atlantic is about 5° further north.

July Isotherms.

74. The maximum temperature has by July shifted to the tropic of Cancer. The isotherm of 90° encloses three "**poles**" of heat, in the south-western United States, in North Africa, and in Arabia and central Asia.

The southern isotherm of 32° has advanced nearly to the latitude of Cape Horn. In the northern hemisphere the land is hotter than the sea, and therefore the isotherms are bent northward in crossing the continents, not southward, as in the winter (Fig. 35).

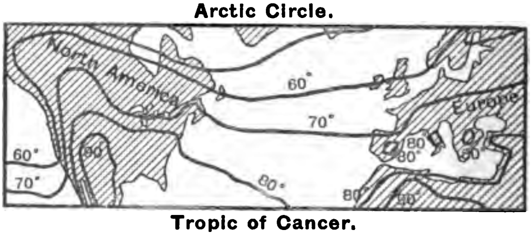

Fig. 35.

JULY ISOTHERMS.

Thus the isotherm of 60°, crossing the Pacific about lat. 40° N., bends northward in Canada nearly to the Arctic Circle, passes through Newfoundland to the British Isles, and thence through the Baltic and the White Sea, till in Siberia it reaches the Arctic Circle again, and then bends sharply southward on reaching the cool Pacific.

The isotherms of the British Isles will be considered more in detail in Chapter VII.

ISOBARS.

75. Isobars are lines on a map joining together places where the atmospheric pressure is equal. Isobars may be drawn to represent *average* pressures for a given period of time, and they are then useful in the consideration of the connexion between atmospheric pressure and the permanent and seasonal winds of the earth.

Isobars are also drawn from day to day on "weather-charts" to represent merely temporary conditions of pressure. The study of these temporary isobars affords the chief material available for forming forecasts of the weather, which are issued daily in most civilised countries.

Winds blow from regions of high pressure to those of low pressure, and if the earth were stationary their direction would be at right angles to the isobars. But in accordance with Buys-Ballot's law the direction of wind is deviated into a spiral. The deviation increases with the latitude, so that in high latitudes the winds are nearly parallel to the isobars.

When isobars are close together, they represent a considerable difference of pressure in a short distance, and therefore the wind is strong; when the isobars are widely separated they indicate that there is only a slight wind. The difference of pressure between two places, divided by the distance between them, is known as the "**barometric gradient,**" and the force and velocity of the wind are directly proportional to this gradient.

It is found that in our climate, and throughout most of the north temperate zone, the weather is mainly determined by large eddies or whirls of air, which are of two distinct classes, called **cyclones** and **anticyclones**.

76. A **cyclone** is a portion of the atmosphere in which the pressure is lowest in the centre, gradually increasing outwards in every direction. The isobars are circular or elliptical, and the winds blow in *spiral* curves around, and at the same time towards the centre, the direction of the wind being counter-clockwise in the northern hemisphere. The cyclone as a whole moves forward, generally westward in low latitudes, and north or north-east in higher (northern) latitudes.

From the fact that air is moving towards the centre of a cyclone, it is obvious that in the centre the air must be rising. If this rising air contains any considerable amount of water vapour (and our cyclones generally come from the Atlantic), its rising to a cooler level must produce rain; hence cyclonic weather is almost invariably rainy weather.

The approach of a cyclone is heralded by a falling barometer, a gloomy sky, and oppressive "muggy" air, usually followed by heavy rain. As soon as the centre of the storm has passed, the barometer begins to rise, the air feels much fresher, and patches of blue sky can generally be seen, though there are further showers and squalls in the rear of the storm.

Fig. 36 (at end of book) shows the isobars, winds, and weather of a typical autumn cyclone which has travelled north-eastwards across the Bay of Biscay (as shown by the line of crosses), and is centred, at the time of observation, near the middle of the English Channel. The barometric gradient, shown by the closeness of the isobars, is steeper behind the centre than in front of it; and the sea is roughest on the coast of Brittany.

77. The following are the "Notes on the General Situation at 8 a.m." issued in connexion with this chart by the Meteorological Office:—

"The cyclonic system has remained almost stationary over the English Channel during the night, and the lowest barometer reading, about 28·8 ins., is found midway between Jersey and Portland Bill. Pressure is at present changing very little in the immediate neighbourhood of the depression.

"The wind blows a gale from north-north-east at Donaghadee and Pembroke, is high from north-east at Holyhead, and from east at North Shields and Portland Bill, while on the coast of Brittany it is high from the north-westward. On the south-east coast of England there is a fresh to strong southerly breeze and on the coast of Jutland a strong breeze from east. Temperature has fallen in

France and Scandinavia, risen in most other regions. It now ranges from 59° at Munich and 55° at Nice to about 50° over a large part of England, to a little above 40° in Scotland, and to 39° at Birr Castle. At Thorshavn the reading is as low as 25°. The weather is fair or fine in Scandinavia, and the sky is temporarily clear at a few of our own stations, but generally the conditions are very unsettled, with rain or passing showers in many parts of this country and also at Frankfurt."

78. The succession of winds and weather experienced at any given place during the passage of a cyclone through or near it can be approximately determined by drawing on tracing paper a set of circular or oval isobars, with counter-clockwise arrows to represent winds; and then passing the paper in any required direction over the map. The student should investigate in this way the passage of cyclones over various parts of the British Isles, especially in easterly and north-easterly directions.

The following rule will be found useful in connexion with questions concerning winds:—"Stand with the low pressure on your left hand, then the wind is blowing on your back." This applies only to the northern hemisphere. For places south of the equator substitute "face" for "back."

79. An **anticyclone**, as the name implies, is the opposite of a cyclone; *i.e.* the pressure is greatest in the centre, and diminishes outward. The winds blow spirally outward, their direction in the northern hemisphere being clockwise.

An anticyclone is a considerably more stable system of pressure than a cyclone, and frequently remains for several days nearly in the same position; it is evident that to do so it must continually receive fresh supplies of air from above. This air gets warmer in descending, hence no clouds are formed, and anticyclonic weather is characterised by clear skies. It is calm and hot in summer, with heavy dews at night; calm and cold in winter, with fogs in towns and over water. It is only during anticyclonic conditions that we get, in the British Isles, any considerable periods of settled fine weather.

Fig. 37 (at end of book) shows the isobars of an autumn anticyclone centred over the north-east of England. It will be observed that the barometric gradient is very slight, the greatest difference of pressure in the British Isles being only about one-tenth of an inch (compare Fig. 36, where the difference in pressure between the north and south of Great

Britain is nearly an inch). The winds are accordingly light, and the sea generally smooth.

The following are the official "Notes on the General Situation at 8 a.m.":—

> "The central area of the anticyclone has now become transferred to the north-east of England and the adjacent portion of the North Sea, while the barometer has fallen quickly over the region between Iceland and Scotland, and risen briskly over Sweden.
>
> "The anticyclonic circulation of the wind is well marked over our Islands and their neighbourhood. The north-easterly current blows freshly at some of our south coast stations and strongly at Belfort, but generally there is little force. In Norway and Sweden the westerly to north-westerly winds are moderate or fresh. Temperature has fallen at nearly all our own stations and over northern Europe. It is now as low as 34° at Wick and below 50° over Scotland generally, as well as in central Ireland. At Blacksod Point and Jersey the reading is 61°, and at some of our south-western stations 58°. The sky is clear or nearly so over the greater part of the Continent, and in many parts of England; cloudy or overcast in Ireland and Scotland and the west of Norway, while rain is falling over the major portion of Iceland."

Storms.

80. In temperate latitudes cyclones are usually of large size—several hundred miles across—and the gradients are rarely so steep that the winds do much damage, even to shipping. The **hurricanes** of the West Indies and the **typhoons** of the China Seas are much smaller cyclones, with very steep gradients, resulting in winds of terrific violence, which often do great damage. Hurricanes and typhoons occur chiefly in the late summer and autumn. They develop in the tropics and move in spiral clockwise paths into the temperate zone.

The even more destructive **tornadoes** of the lower Mississippi valley are whirlwinds produced on summer days by local heating of the air. The destructive track of a tornado is usually not more than a quarter of a mile wide and 30 miles long, but within that space its ravages are singularly complete. The **simoom** of the Sahara Desert is a similar whirlwind laden with sand. At sea the pressure at the centre of a tornado may be so small as to suck up a column of water, forming a **waterspout**.

TYPES OF CLIMATE.

81. One broad distinction of climates into oceanic and continental climates has been already mentioned. This is, however, only a rough division, based on one only of the many factors that go to make what is called climate. The alternating belts of calms and winds, described in Chapter II., serve as a basis for a more detailed treatment of the climates of different parts of the world.

(*1*) *Equatorial Belt.*

82. The equatorial belt of calms is always hot and always rainy. The daily range of temperature is greater than the seasonal range. Thunderstorms are in many places of almost daily occurrence, usually taking place in the afternoon. Dense tropical jungle is the characteristic vegetation. As explained in Chapter II., the belt of calms moves north and south with the apparent movements of the sun, but not to so great an extent as the sun. It is almost on the equator during the northern winter, and a few degrees north of it during the northern summer. Hence the belt of calms passes twice each year over places within, say, 5° north of the equator, and these places have two wet seasons and two dry seasons each year, because when they are not under a nearly vertical sun they are under the influence of the dry trade winds. Places just south of the equator, or from 5° to 10° north of it, generally have a wet season only once a year, always in summer.

(*2*) *Trade-Wind Belts.*

83. The trade winds blow constantly from cooler to warmer regions, and therefore in passing over the sea pick up much moisture, which is condensed when the winds blow over rising lands. Hence coasts which face eastward in the trade-wind zones have a heavy rainfall. This is exemplified in the East and West Indies, eastern South

America on both sides of the equator, south-eastern Africa, and eastern Australia.

In blowing across continents, however, the trade-winds become very dry winds, as in approaching the equator they become capable of absorbing more and more water vapour from the land. All the **great deserts** of the world, in fact, lie in the trade-wind zones. In the southern hemisphere a large part of central Australia, western South Africa, and the central part of western south America exhibit desert conditions.

In the northern hemisphere a portion of the western United States is desert; and in the Old World the largest desert area of all extends continuously from the Atlantic through northern Africa, Arabia, southern Persia, and across a large part of central Asia. Owing to cloudless skies, loss of heat by radiation is very rapid in desert regions, and there is a great difference between day and night temperatures.

On the equatorial margins of the trade-wind belts are found some of the most important **grass lands** of the world—known as **llanos** in Venezuela, **campos** in Brazil, **park lands** in Africa, and **downs** in Australia. During summer they are in or near the equatorial rain-belt, and there is an abundant growth of pasture grass; but afterwards there is a long dry season. The drought is so long and so complete that these regions are almost treeless, except along the rivers.

(3) *The Monsoon Region.*

84. In the region where monsoons are well developed (India, Indo-China, southern China) there are, generally speaking, three seasons in the year—a hot dry spring, a hot, very rainy summer, and a cool winter season with little rain. The summer monsoon (S.W. in India, S.E. in China) begins about May and lasts till September, the intervening months being very wet (Fig. 38).

On the Khasi Hills in Assam, where the warm damp wind from the Bay of Bengal begins to rise, there is an average annual rainfall of about 500 inches, nearly the whole of which falls in the summer. Over 30 inches of rain (about the annual average for England) have been known to fall there *on each of five successive days.*

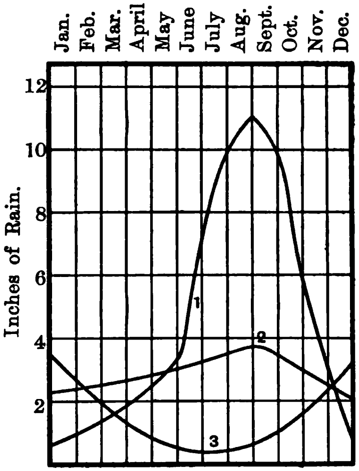

Fig. 38.

Typical Rainfall Diagrams for Northern Hemisphere.

1. Monsoon rainfall; 2. Continental rainfall (temperate zone); 3. Mediterranean rainfall.

The combination of heavy rainfall with high temperature makes the monsoon countries perhaps the most productive in the world, and they are the most densely populated regions, with the exception of the manufacturing districts of Europe and North America.

In September or October the summer monsoon dies away, and the north-east winter monsoon begins. This is a dry wind over the greater part of India, but, after crossing the Bay of Bengal, it brings rain to the extreme south-east of India, where winter is the rainy season, and to Ceylon, where there is a fairly heavy rainfall all the year round.

(4) *Horse Latitudes.*

85. The outer or temperate margins of the trade-wind belts have on the whole a rather dry climate, with more winter than summer rain, and with a considerable range of temperature. These regions contain the most important natural grass-lands of the world, *i.e.* the **steppes** of south-eastern Russia and south-western Asia, the **prairies** of the middle United States, and the **pampas** of the Argentine Republic.

Climates with moderately wet winters and almost entirely rainless summers (Fig. 38) occur especially *on the west side of continents* in the horse latitudes. The rainless summer is due to the trade winds; but in winter, owing to the annual migration of the belts of climate, these places are on the edge of the westerly rain-bearing winds.

A climate of this type is known as a **Mediterranean Climate**, because it is exhibited on the largest scale by the countries round the Mediterranean Sea. A similar climate is found in California, central Chile, the south-west of Cape Colony and of West Australia, and the south of South Australia. Such regions are naturally not so productive as the monsoon regions, but their abundant sunshine produces fruits and wheat of very high quality, especially where irrigation is practised.

(5) *Temperate Climates.*

86. As already mentioned, the weather of the north temperate zone is largely determined by cyclonic disturbances, which usually come from the west. Hence the western sides of the continents in these latitudes have a heavier rainfall than the eastern sides, and are also, owing to ocean currents, considerably warmer.

The rainfall is fairly evenly distributed throughout the year; there is no really dry season. As a rule, however, more rain falls in the late summer and autumn than in winter or spring (Fig. 38). In the interior of the northern continents there is a very great difference of temperature between summer and winter.

87. There was once probably an almost continuous belt of **forests** in the north temperate zone, though over large areas the forest has now been cleared for agriculture. The trees are of great variety, deciduous trees—oak, elm, beech, birch, ash, and lime—being among the most important on low-lying ground, while further north and on mountain slopes the chief trees are coniferous—pines and firs. In places with heavy rainfall and a temperate oceanic climate trees grow to enormous size. The north-western United States and south-eastern Australia are especially famous for their big trees.

The weather of places in the north temperate zone is probably more variable than in any other part of the world. In midwinter severe frost may be followed within a few days by oppressive warmth. May is sometimes colder than April, and the hottest days of a year not infrequently occur as late as September.

88. In the temperate zone of the southern hemisphere there is a smaller annual range of temperature, and owing to the greater strength and constancy of the west winds the weather varies less from day to day. Generally speaking, places in the southern hemisphere are somewhat cooler than those in corresponding northern latitudes. One of the causes of this is that during the northern summer the earth is farther from the sun than during the southern summer, and nearer the sun during the northern winter than during the southern winter.

(6) *Arctic Climates.*

89. At the time of the "**midnight sun,**" *i.e.* in summer, places near the Arctic Circle have a cool damp climate, with frequent rain and fog. The ground is generally swampy; grass, moss, and lichens are the only vegetation. In winter, when the sun has set, not to rise again till next spring, the ground is deeply frozen and covered with snow, while the sea is ice-bound. The moss-covered marshes of Arctic regions, frozen hard during the greater part of the year, are known as **tundras**. Agriculture is impossible, and the very scanty population lives by hunting and collecting furs. The reindeer is the only domestic animal.

DISTRIBUTION OF PLANTS.

90. Some incidental references to plant life have already been made in this chapter, and the subject will be further considered in later chapters, as economic geography depends principally on the distribution of plants, which in its turn depends chiefly on climate. The following table is a rough general synopsis of the different kinds of vegetation found in different zones of climate from the equator to Arctic or Antarctic regions. It applies with a fair degree of accuracy to most parts of the world, except the monsoon regions and sea-coasts.

Lat.				
90° 80°	Polar ice.			
70°	Tundras (moss, lichens, dwarf trees).			
60 50° 40°	Temperate forests. Fruits.	Cereals	Rye Oats Barley Wheat Maize Tobacco.	Westerly winds.
30°	Grass Lands. Pasture grasses. (Steppes, prairies, pampas.)			Horse latitudes.
20°	Desert (palms, etc., near water).			Trade winds.
10°	Grass lands. Pasture grasses. (Llanos, campos, etc.)			
0°	Tropical forest (palms, baobab, mahogany, teak, etc.).			Doldrums.

Outside the monsoon region the belt of temperate forests (largely cleared) is by far the most densely inhabited part of the world. The deserts and the tropical forests are almost as uninhabited as the tundras. The pampas and the prairies are rapidly growing in population.

CHAPTER V.

THE CRUST OF THE EARTH.

LAND FORMS.

91. We shall briefly consider, first, some of the typical superficial **land forms**, and shall then deal with the chief causes which have produced so many different varieties of scenery. Land forms may be roughly classified into mountains, hills, plains, table-lands or plateaus, and hollows.

The distinction between **mountains** and **hills** is a purely conventional one, and there is no general agreement as to the height which differentiates one from the other. Mere height above the sea does not constitute a mountain. There are, for instance, hills in Tibet, the summits of which are higher than Mont Blanc, although they only rise a few hundred feet above the surrounding plain.

Considering only the great mountain ranges, we shall find that these are never single, but consist of two or more (sometimes very many) nearly **parallel** ridges, with long wide valleys between. The sides of the ridges are seamed with narrower **lateral** valleys, down which streams run into the main **longitudinal** valleys. Two lateral valleys meeting on the crest of a ridge form a neck, col, or **pass**.

Passes are of great importance in determining the routes of **roads** or railways across mountain ranges. In a large mountain system considered as a whole there is generally a steep slope on one side and a much more gradual one on the other. Fig. 39 gives a typical section of such an arrangement, with the slopes greatly exaggerated. In Europe and Asia, where the great ranges run, on the whole, east and west, the steep slope is on the **south**; in America, where the main mountain axis runs north and south, the steep slope is on the **west**.

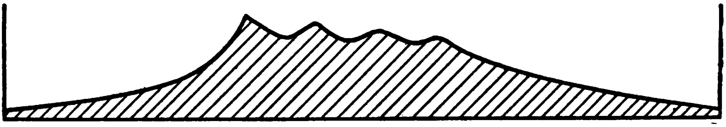

Fig. 39.

92. A **plain** is an expanse of level, or very nearly level, land; it is called a **low** plain if it is less than 600 feet above the sea, and a **high** plain if at a greater elevation.

The term **plateau** or **table-land** is generally loosely used to indicate a high plain, but in strictness it has a narrower meaning: it is a high plain which descends on all sides to lower ground. A high plain girdled by mountains should not be called a plateau.

A **valley** is formed by the meeting of two convergent slopes, which may be either (1) very steep and near together, forming a cañon, gorge, or defile; (2) steep but separated by a considerable distance; or (3) only sloping very gently. Most valleys have a river running along their central line where the two slopes meet, though some valleys, especially in limestone or chalk districts, are dry. Nearly all valleys, however, are partly or wholly the results of the action of rivers.

A **watershed**, or water-parting, or divide, is the line of meeting of two divergent slopes. A watershed is the converse of a valley, and separates one valley from another.

The **basin** or drainage-area of a river is the whole area from which water drains into that river. Thus the main watersheds form the boundaries of separate river-basins; minor watersheds separate the streams flowing into one tributary of a river from those flowing into another tributary. *E.g.*, the main watershed of the Pennine Range divides the Yorkshire Ouse from the Lancashire rivers; while the several tributaries of the Ouse are separated by minor watersheds.

A **depression** is an area nearly or entirely surrounded by higher land. As one would expect, depressions are generally partly filled by **lakes**, which are drained by a river if the girdle of high land is incomplete. In dry regions depressions contain salt lakes, or beds of salt, the remains of lakes. Nearly a quarter of the earth's surface has "**inland drainage,**" *i.e.* its water runs into hollows which have no outlet.

MATERIALS OF THE EARTH'S CRUST.

93. The term **rock**, as used by geologists, includes no only masses of stone, but also soil, sand, gravel, clay—any mineral substance, in fact, occurring in quantity in the crust of the earth. Rocks may be roughly divided into three classes—igneous, sedimentary, and metamorphic rocks.

Igneous rocks are those which have solidified from the molten state. They are of all ages, some being the oldest rocks of which we have any knowledge, while others are being formed to-day by the cooling of lava from volcanoes. Generally speaking, apart from the products of recent volcanoes, igneous rocks occur near the surface only in mountainous regions. Granite and basalt are among the most common and important igneous rocks. Both are very hard and durable.

Sedimentary rocks are those which were deposited from water in lakes and shallow seas, and have since, by some movement of the earth's crust, been raised above sea-level. The layers or **strata** are of many different kinds and of very varying thicknesses, from a few feet, or even inches, to many thousand feet. They were originally deposited horizontally, but movements of the crust have tilted them in all directions.

Most sedimentary rocks contain **fossils**, which are of value in deciding the age and mode of formation of the rock. Among the most important of this class of rocks are sandstones, gravels, clays, shales, chalk, limestone, and coal. The three last are of **organic** origin, chalk and limestone consisting chiefly of the remains of animal shells, and coal of the remains of plants.

Quartz (silica), kaolin and other silicates of alumina, oxides of iron, and carbonate of lime (chalk and limestone) are among the most important constituents of sedimentary rocks.

Metamorphic rocks are those which have been changed from their original form by heat or pressure or chemical changes. Metamorphism generally makes rocks harder or more crystalline; *e.g.* sandstone changes into quartzite; limestone into marble; clay into slate; coal into anthracite ("steam coal," which is nearly pure carbon).

TEMPERATURE OF THE EARTH'S CRUST.

94. Although the temperature of the surface of the earth varies very considerably between day and night, summer and winter, this effect does not penetrate beyond a depth of about 40 feet. Below this, the temperature increases fairly uniformly at the rate of about 1° F. for every 50 feet. Thus at a depth of a mile the temperature is about 100° F. higher than in the surface layer, and at a depth of 30 miles is high enough to melt any rock.

It is usually considered, however, from physical and astronomical reasoning, that, in spite of its very high temperature, the interior of the earth is more or less **solid**, being kept so by the enormous pressure of the rocks of the crust. Students of physics will know that increased pressure raises the melting-points of nearly all solids.

Abundant evidence of the high temperature of the earth's interior is afforded by observations in deep mines, by hot springs, geysers, and above all by volcanoes.

CHANGES IN THE EARTH'S CRUST.

95. The **form** of the earth's surface is constantly changing—sometimes suddenly, but as a rule slowly and gradually. Some of the highest mountain ranges in the world are, from a geological point of view, quite recent, while some nearly level plains and low hills are very ancient. Old sea-beaches, coral reefs, and fossils of marine animals are found on mountain slopes far above the sea. There is abundant evidence that the present bed of the North Sea has been dry land, and that at another period nearly the whole of England has been under water.

Distinct **changes in coast lines** have taken place within historical times. Towns and villages on the east coast of England have been washed into the sea, while in the south-east of England old seaports are now inland towns. The coast of Chile has twice within the last century been suddenly elevated two or three feet. Part of Sweden has risen about seven feet in the last 150 years. At Puzzoli, near Naples, are the ruins of an old temple, the columns of which, up to a certain height, have been bored by shellfish, proving that after the temple was built it had been lowered by earth movements till it was half submerged, and had subsequently been raised again to its present position. These instances of change of level might be multiplied indefinitely.

96. The detailed form of the earth's surface is the resultant of two causes: (1) **denudation,** *i.e.* the wearing down of the surface by weather (rain, wind, frost, etc.), rivers, waves, and, in some places, glaciers; (2) movements of **elevation** or **subsidence** of the crust.

Denudation acting alone would, in the course of ages, bring all the land down almost to sea-level, as rain and rivers are constantly removing solid material, grinding rocks to powder, and ultimately depositing them in the sea. Erosion is, however, counterbalanced by movements of elevation, either rapid local upthrusts, or, more generally, slow movements affecting large areas.

The earth as a whole is cooling, and therefore contracting, while the crust remains at about the same temperature. Hence, to accommodate itself to the lessening dimensions of the interior, either (1) the crust must fall into wrinkles or **folds**, of which the ridges are mountains and the troughs valleys (Fig. 40); or (2) parts of the crust must break off and sink to a lower level, leaving the parts which do not fall standing out as tablelands (Fig. 41).

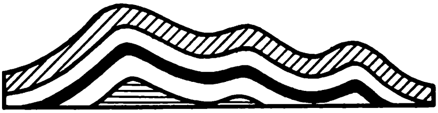

Fig. 40.

SECTION OF FOLDED MOUNTAINS BEFORE EROSION BEGINS.

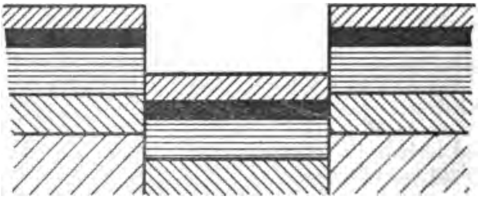

Fig. 41.

SECTION OF "RIFT-VALLEY" BEFORE EROSION BEGINS.

The valleys mentioned above as being formed by wrinkling of the earth's crust are only the larger longitudinal valleys found between mountain ranges, *e.g.* the upper valley of the Rhone, above Lake Geneva. **Secondary** valleys, both longitudinal and transverse, have been produced by river action; and in fact the **primary**, structural, or "tectonic" valleys themselves have in nearly all cases been much modified by rivers.

A line along which a fracture of the crust has taken place, with the result that the strata have slipped down on one side, is called a "**fault.**" The extent of the slipping may be anything from a few inches to thousands of feet. A fault is only rarely a visible feature of a landscape, as in course of time it is usually masked by denudation of the higher ground, and deposition of sediment on the lower.

Faults are, however, very numerous and of great importance. A "**rift-valley**" is produced by two large parallel faults between which the strata have slipped down, as shown in section in Fig. 41. The lowlands of Scotland, between the Highlands and the Southern Uplands, are an old rift-valley much modified by denudation, as is also the middle valley of the Rhine, between the Vosges and the Schwarzwald. A very long rift-valley exists in eastern Africa, along the line of the equatorial lakes. There is another well-marked rift-valley in Syria, occupied by the Jordan and the Dead Sea. Other examples are found in the western United States.

MOUNTAINS AND VALLEYS.

Mountains.

97. The true mountain ranges of the world appear to be in all cases the results of wrinkling of the earth's crust; they are called **mountains of elevation** or **folded mountains.** As already mentioned, a range very seldom consists of one fold. There are often many parallel or concentric ridges. In some regions there are two distinct sets of folds at right angles to each other. This is the case in the Alps.

Mountains of another kind are the result, not of elevation, but of **denudation.** Rocks vary very greatly in their resistance to the action of air and water; some are much softer or more soluble than others. Hence when erosion acts for a long period on a table-land, the softer and more soluble rocks wear away, while the harder and more durable rocks remain standing out from the general level as peaks, ridges, or terraces. These are known as **mountains of circumdenudation.**

Regions formed in this way by prolonged denudation have been termed "**dissected plateaus.**" The mountains occur in complex groups and knots, not in lines, and the valleys are relatively much less important features than they are in true mountain ranges. The Highlands of Scotland and of Scandinavia are typical examples of dissected plateaus.

Speaking of such regions, Lord Avebury says: "The existing summits are not those which were originally raised the highest, but those which have suffered the least by denudation."

Valleys.

98. In regions of folded mountains the longitudinal valleys are the **troughs** of the earth-waves, of which the mountains are the crests. They have not been worn out, but are primary elements of the structure of the country, though they have all suffered more or less denudation.

The lateral valleys, on the other hand, are entirely the results of denudation. There are numerous cases in which a river cuts right through a mountain system from one side to the other. For instance the Elbe cuts through the Erz Gebirge; the Susquehanna and Potomac through the Appalachian Mountains. In such cases the river probably **preceded** the mountains, and has been cutting down its bed through all the ages during which the mountains were uplifted.

AGENTS OF DENUDATION.

(1) Heat.

99. The alternate **expansion** and **contraction**, by day and night, of surface layers of rock, causes cracks in the rock, and fragments are split off.

(2) Frost.

100. Water lodges in crevices of rocks, **freezes** there, and by its expansion enlarges the cracks, and breaks pieces off.

(3) Solution and Decomposition.

101. The direct action of air, aided by water and the gases dissolved in it, erodes some rocks by producing chemical changes. Kaolin, or china-clay, is formed by the decomposition of granite. Limestone is dissolved by water containing carbon dioxide. Hence limestone regions are rich in caves, and much of the water of such districts flows underground instead of on the surface.

102. The work of heat, of frost, and of direct aerial action may be included under the general term **weathering.**" The results of weathering can be seen at the base of any cliff or steep rock slope. There is, almost invariably, a **talus** or slope of loose rock fragments, large and small.

If the cliff is close to the sea, these fragments are washed to and fro by the waves, and ground against each other and against the cliff, thus forming a very powerful instrument of erosion. The rocks are gradually reduced in size from boulders to pebbles, and ultimately to sand.

The most general and important result of weathering is the conversion of rock into soil. If the weathered residue is chiefly silica, it forms **sand**; if it is chiefly aluminium silicate, **clay** is produced. Most soils are intermediate in composition between sand and clay. Earthworms and plants are effective agents in the final stages of the disintegration of rock into soil.

(4) *The Work of Wind.*

103. On sandy coasts and in sandy deserts **wind** is an important agent in distributing materials. Sand is heaped up by the wind in the form of long, low ridges, called **sand dunes**, which in parts of the Sahara are as much as 600 feet high.

On the south-west coast of France the advance of sand dunes inland through the Landes has necessitated special measures to stop their progress and save agricultural land. On the subsiding Dutch shore sand dunes act as a protection against the sea.

Thick deposits of fine yellow clay, called **loess**, found in certain valleys of the Alps and Carpathians, and especially over a very large area of northern China, are believed by many geologists to have been carried to their present position by wind.

(5) The Work of Water.

104. Water is by far the most important of all instruments of denudation. Rain falling on the earth washes away the softer or more soluble constituents of rock or soil, and removes them to lower levels. When the surface strata are permeable to water (as sand, gravels, etc.) a considerable proportion of water sinks underground, to reappear generally at a lower level in the form of springs, which give rise to streams.

The "**sculpturing**" of the earth by the direct action of rain is seen most distinctly on clayey soils in dry regions where rainfall, though infrequent, is occasionally heavy. The extensive region of "Bad Lands" in south Dakota is an example of a rain-sculptured district, the surface being carved into many fantastic forms. The name "Bad Lands" was originally applied on account of the difficulty of travel over this region.

(6) The Work of Rivers.

105. In the upper part of the course, where the slope is steepest, the work of the river is purely destructive: it deepens its bed and cuts out its banks.

In dry climates there is little weathering of the rocks, and the sides of the valley are very steep, or even almost perpendicular, as in the great **cañons** of the Snake and Colorado Rivers in the western United States.

In rainy districts weathering takes place much more rapidly, and valleys are much broader, with gently sloping sides; though if the stream cuts through specially hard resistant rock the sides become steep again and the valley narrow.

In the lower part of its course the work of a river is partly or wholly **constructive**. The water, flowing down a much more gentle slope, has lost much of its velocity, and instead of moving pebbles and gravel, as in the torrential part of its course, can only transport fine sand and mud.

Thus the river is **aggrading**, instead of **degrading**, its bed; during floods it deposits layers of sediment (alluvium) over all the adjacent low-lying ground; and at normal times the stream flows between banks which it has itself raised; in settled countries these banks have often to be artificially strengthened to prevent floods (Fig. 43).

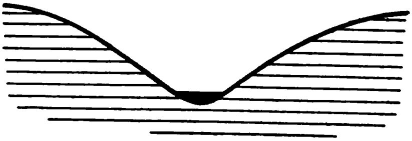

Fig. 42.

SECTION OF YOUNG VALLEY FORMED BY EROSION.

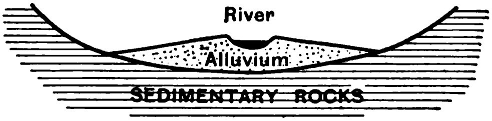

Fig. 43.

SECTION OF OLD VALLEY COVERED WITH ALLUVIAL SOIL.
VERTICAL SCALE EXAGGERATED.

The lower courses of the Po, Ganges, Mississippi, and many other great rivers are occupied by "**flood-plains**" of very fertile soil laid down by the river. Across the flood-plain the river swings in curves (*i.e. meanders*) from side to side. This arises from the fact that a river always cuts away its bank where this is concave, and deposits sediment on the opposite side where the bank is convex; thus any slight curve caused by an obstacle in the stream or by trifling irregularities in the ground, tends continually to increase (Fig. 44).

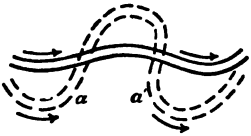

Fig. 44.

ORIGINAL COURSE OF STREAM ——
LATER COURSE OF STREAM - - -

Two curves may in time approach so near each other that the stream cuts across the narrow neck of land (*a a'*) between them, and resumes for a time a straight course.

106. When a river enters the sea or a lake, its current is suddenly checked, and the solid material brought down by the water falls to the bottom. If tides and currents are not very strong, the sediment accumulates till it rises to sea-level, and forms new alluvial land, usually fan-shaped, and intersected by numerous branches of the stream. These formations are called **deltas**.

The name delta is derived from the Greek letter Δ (delta), because one of the earliest known and most typical deltas, that of the Nile, is roughly triangular in shape. Deltas are among the most densely settled regions of the world, because the soil is very fertile and irrigation is easy.

Deltas on a small scale can be seen in the English lakes, *e.g.* at the northern end of Windermere; and many of the Italian lake-towns are built on deltas. The delta of the Po has grown more than 20 miles eastward into the Adriatic Sea within historical times.

107. Where a river enters a tidal sea through a **wide shallow estuary**, the currents prevent the formation of a delta, but pile up sediment in **sand-banks**, which sometimes make the entrance to the river difficult and dangerous, especially as they often change their position.

Rivers which enter the sea directly, without an estuary, usually have a **bar** of sand or pebbles across the mouth, with one or more gaps kept open by the current or by tides. This is the case with many African rivers.

Where the slope of a river bed changes suddenly, as where it emerges from mountains on to a plain, a **river cone** or **alluvial fan** is produced by the gravel and other *débris* deposited owing to the sudden decrease in the velocity of the stream.

These river cones are really **inland deltas**, but their slope is usually much greater than that of true deltas, which appear quite flat, though they have of course a slight inclination to the sea. River cones are often formed at the confluence of a rapid tributary with a slower main stream. They are common at the base of any large mountain range. A good example can be seen near Chamonix, in the Alps.

(7) *The Work of Ice.*

108. Ice is at present important, as an agent of erosion, only in high mountains and in Arctic regions; but in the "glacial period" many parts of the north temperate zone (including all the British Isles north of the Thames) were covered with a great ice-sheet similar to that which now covers Greenland, and there were immense glaciers on mountains now far below the snow-line.

A **glacier** is essentially a slow-moving river of ice, descending a mountain valley at a rate varying from one to about fifty feet a day. In Arctic regions the ends of the glaciers reach the sea and break off in great masses, which float away as **icebergs.** In lower latitudes the ice melts on reaching a certain level, and forms a river.

Rock fragments fall from the surrounding slopes on to the side of a glacier, forming in time a continuous loose ridge called a **lateral moraine**. Other rocks, which are gradually ground up into sand and clay, are carried along at the bottom of the ice, forming the **ground moraine,** which is constantly increased by rocks falling into **crevasses,** or cracks in the ice.

When two glaciers meet, the lateral moraines on the adjacent sides unite to form a **medial moraine** (Fig. 45, *b*).

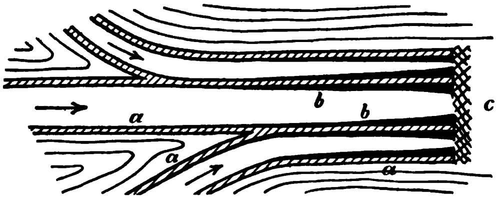

Fig. 45.

A Glacier and Tributaries.

a a, lateral moraines; *b b*, medial moraines; *c*, terminal moraine; ⟶ direction of flow; —— contour lines.

At the end of the glacier, where the ice melts, all the rock material brought down by the glacier accumulates as a **terminal moraine**, a long mound of clay or sand, overlaid irregularly with pebbles and boulders.

Terminal moraines may be as much as 200 feet high; they have in some cases dammed up valleys, forming lakes after the disappearance or retreat of the glaciers. Moraines are not really so well marked as is shown in Fig. 45. In the lower parts of glaciers the moraine is usually scattered all over the surface.

LAKES, FJORDS, AND RIAS.

109. The lakes of mountainous regions, *e.g.* the Alpine and most of the English and Scottish lakes, occupy rock-basins which, according to some authorities, have been scooped out by glaciers, as a graving tool makes a groove in a piece of metal. Other authorities hold—and their view appears to be gaining ground—that these rock-basins existed before the Ice Age, and are not due, entirely, at any rate, to the action of ice. Glaciers, however, although they may have had little to do with the formation of lakes, have certainly, aided by weathering, been important agents in the transportation of rock material.

Mountain lakes, however they have been formed, are almost invariably long and narrow, and are often very deep. They generally find an outlet through a shallow notch cut either in the rock at their lower end, if they occupy true rock basins, or in the bank of morainic material which frequently forms the lower boundary of such mountain lakes.

On the Norwegian coast and the west coast of Scotland a subsidence of the land has connected many former lakes with the sea, forming **fjords** or sea-lochs. At the entrance of each of these is a sill or bar, sometimes only 20 feet or so below the surface, although further in the water may be several hundred feet deep.

Where a river valley, as distinct from a rock basin, has subsided, a long gulf is formed, but there is no bar at the entrance, and the depth increases uniformly from the head of the gulf outwards. Inlets of this kind are called **rias** or **drowned valleys.** Fjords and rias are only formed by the subsidence of mountain valleys; the submergence of lowland valleys gives rise to wide estuaries like the Firth of Forth. The inlets of the west and east coasts of Scotland show very strikingly the difference in character between fjords and estuaries.

110. The ice-sheets of the glacial period, when they melted, left an irregular deposit of **boulder-clay**, which covers large areas of Europe and North America, in some cases to a considerable depth. The network of lakes in northern Russia, Finland, and Scandinavia occupy comparatively shallow depressions in the boulder-clay, and were probably formed by the damming of valleys by moraines.

VOLCANOES.

111. Volcanoes are conical mountains built up of materials ejected from openings in the earth's crust. Several different theories are held as to the causes of volcanic disturbances. One of the most probable causes is the expansive force of steam, produced under very high pressure by contact of underground water with highly heated rocks.

The tube through which volcanic materials are erupted is called the **neck** of the volcano (Fig. 46). During quiescence it is usually filled with a plug of solid lava. The neck ends at the top in a cup-shaped hollow called the **crater**. Most craters are comparatively small, but some are several miles in diameter. In many recently extinct volcanoes the old crater is occupied by a lake, *e.g.* Crater Lake in Oregon, the deepest lake in North America; Lake Avernus in Italy.

In older volcanoes the rim of the crater has usually been broken down by weathering, and the lake drained off, while the conical form is greatly modified by denudation.

Volcanic Materials.

112. Steam and sulphurous gases are ejected in large quantities during volcanic eruptions. On account of the steam an eruption is generally followed by heavy local rain, which often forms mud streams out of the loose ash lying on the side of the mountain. The chemical reactions of various gases produce deposits of sulphur around the volcano. Fragments of rock of different sizes are also flung up to great heights.

By far the most important volcanic material, however, is **lava**, which is simply melted rock. This wells up the neck of the volcano and either overflows the crater or breaks through the rim, and flows down the slope until it becomes cool enough to solidify.

Some lava streams in the Hawaiian Islands are more than thirty miles long and two miles wide. Sometimes lava breaks through the side of a volcano instead of rising to the crater. A subsidiary cone is then formed by the deposit of materials round the new outlet.

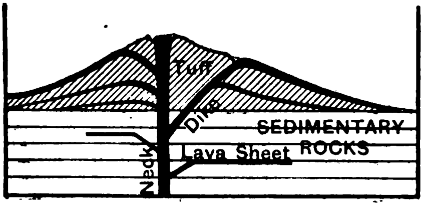

Fig. 46.

SECTION OF A VOLCANO.
Black shading = lava. Light shading = tuff.

The violent outburst of steam through lava blows it into fine fragments called **ash** or **scoria**. It is principally this volcanic ash, settling symmetrically round the crater, that gives the typical volcano its conical form. When consolidated by pressure and chemical action, the ash forms a soft coarse rock called **tuff**.

A volcano usually consists of alternate layers of tuff and cooled lava (dikes), as shown in the section, Fig. 43. **Pumice** stone is a sort of froth or foam formed on lava by gas or steam blown through it.

Intruded Lava.

113. Sometimes the pressure in a volcanic neck forces broad sheets of lava more or less horizontally through the adjacent strata (Fig. 46). These sheets may be afterwards exposed by denudation. A large irregular mass of lava, called a laccolith, may force up the sedimentary strata into a dome-shaped mountain, and no lava may appear on the surface.

Lava Floods.

114. In various parts of the world, and in times not, geologically, very remote, large areas have been covered with **lava floods** welling up from fissures in the earth. The plateaus of the Deccan in India and of the Snake and Columbia rivers in the north-western United States, are regions once covered with lava floods, as also are the inner Hebrides of Scotland and the county of Antrim in Ireland. A large part of Iceland has been covered with lava sheets within historical times.

Distribution of Volcanoes.

115. Active volcanoes are almost invariably near the sea, and are generally in the line of folded mountain ranges. The Andes of South America and the Cordilleras of southern Mexico contain numerous active volcanoes. There are hundreds of volcanic cones in the western United States, but none of them are now active.

A great chain of volcanoes, including many active ones, extends along the **Western Pacific** from the Aleutian Islands in Bering Sea, through the Kurile Islands, Japan, the Philippines, and the East Indies, to New Zealand.

Almost all the islands in the open Atlantic, from Iceland to St. Helena, are of volcanic origin, and some are still active. Most of the coral islands of the Pacific and Indian Oceans are built up on submarine volcanic platforms. In Europe, though there are many extinct volcanoes, active ones are only found in the south and in the east of the Mediterranean. Some peaks of the Caucasus Mountains are still active.

EARTHQUAKES.

116. Volcanic eruptions are almost invariably accompanied by **earthquakes**. The greater and more destructive earthquakes, however, are generally due to more deep-seated geological movements of the earth's crust, owing to contraction. The principal causes of large earthquakes are:—(*a*) Folding of the earth's crust, (*b*) the production of a fault, (*c*) the slipping of the strata along fault planes already formed.

Earthquakes are most common and violent in the neighbourhood of the great ranges of folded mountains. They are frequent along the whole west coast of America, in southern Europe, through a considerable area of central Asia, and along the great ridge of islands extending along eastern Asia and southwards to New Zealand. Both volcanoes and earthquakes are most abundant in a ring extending almost completely round the Pacific Ocean.

Africa and Australia are the continents most free from earthquakes.

The remarks on the origin of folded mountains (§ 96) will help to make clear the association of these regions with earthquake shocks. The mountains are formed where the crust of the earth has been contorted by enormous stresses. Any sudden movement of elevation or depression, or the snapping of the strata, must give rise to a violent shock, which is propagated in all directions through the rocks, and on reaching the surface produces those minute to-and-fro vibrations which are so destructive in their effects on buildings. The regions of maximum frequency of earthquakes are in nearly all cases regions of rising coasts.

RISING AND SINKING COASTS.

117. It is only on the coast that it is easy to observe any vertical movement of the land; alteration in the level of an inland region, taking place gradually, could only be detected by the repetition of exact trigonometrical surveys. Even on the coast it is uncertain whether, in many cases, an apparent rise of the land may not be due to a lowering of the sea-level, caused by lowering of the sea floor.

It is convenient, however, to assume that the apparent changes are due to the movements of the land, and that sea-level is constant.

Judging from observations on coast lines, it appears that **elevation** of the land is at present more widespread than subsidence. **Rising coasts** are found in Chile, Peru, California, British Columbia, on the north of the Gulf of Mexico, on both sides of Scandinavia, the south and east of the Mediterranean, eastern India, northern China, Japan, and most of the East Indian islands.

The chief **sinking coasts** are the east coast of the United States, both sides of the English Channel, and the whole east coast of Australia. In some parts of the world, as in Scandinavia, the character of the coast line proves that subsidence has taken place in the past, although elevation is going on at the present time.

For the most part, straight, regular coasts, like that of western South America, are due to elevation of the land in geologically recent times; and highly indented coasts, like those of Norway and western Scotland, are due to subsidence, which has enabled the sea to flood all the lower valleys.

THE CONTINENTS.

118. The configuration of the separate continents will be treated in later chapters, only a few facts of the most general significance being stated here. The following table shows the area (in millions of square miles) of the six continents, and the percentages of land in each between sea-level and 600 feet (lowland); between 600 and 3,000 feet (upland); and above 3,000 feet (highland).

	Asia.	Africa.	North America.	South America.	Europe.	Australia.
Area.	16·5	11	7·5	7	3·7	3
0-600 feet.	23	12	32	40	54	30
600-3000 ft.	38	62	45	43	37	68
Above 3000 ft.	39	26	23	17	9	2

Europe, which has the greatest percentage of lowland, has the additional advantage of a longer coast-line, in proportion to its area, than that of any other continent. Africa, with the least percentage of lowland, has also the shortest coast-line in proportion to area.

THE PLAN OF THE EARTH.

119. Broadly, the continents are triangular, with their bases to the north, and the oceans are also triangular, with their bases to the south.

There is a ring of land round the Arctic Ocean, with three continents projecting southward, viz. Asia-Australia, Europe-Africa, and America. A ring of water surrounds the Antarctic continent, and three oceans—the Pacific, Atlantic, and Indian—project northwards from it.

The antipodal arrangement of land and water is a striking fact not easily seen on maps. On the globe North America is exactly opposite the South Indian Ocean, and the North Atlantic opposite Australia. Europe and Africa are the antipodes of the central Pacific, while eastern Asia is opposite the South Atlantic, and the Arctic Ocean is opposite the Antarctic continent.

In the northern hemisphere, both in America and in Eurasia,* the **main watershed** runs east and west, *not* along the line of highest mountains, but considerably to the north of it, between Lat. 50° and 60°.

South of the equator the **main watersheds** run north and south—the Andes, the East African ridge, and the Australian divide. These three are placed at almost exactly equal distances apart, being separated by about 120 degrees of longitude.

The most striking features in the configuration of the continents as a whole are two great lines of **folded mountain ranges.**

One extends along the whole east coast of the Pacific, from Alaska to Cape Horn, descending steeply to deep water on the west and to broad plains on the east.

The other, which is not so continuous, extends eastward through Eurasia from the Atlantic to the Pacific. It is mostly bounded on the north by a low plain, and on the south by a series of depressions, partly submerged—the Mediterranean, the Euphrates-Tigris valley, the Persian Gulf, the Indus-Ganges valley.

Africa and Australia differ markedly from Eurasia and America in having no lofty "backbone" of folded mountains; each of them consists essentially of an elevated plain with a slightly raised rim.

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* Namely, Europe and Asia, which from many points of view may be regarded as one continent. See § 120.

South America is sometimes spoken of as the **typical continent**, on account of the relative simplicity of its outline and structure. In reality, however, the number of continents is so limited that no one of them can be taken as a type, each possessing its own individuality. If comparisons are to be made, the six continents fall into three groups: (1) Europe and Asia, (2) the two Americas, (3) Africa and Australia. Northern Africa, however (north of the Atlas Range), belongs geologically and geographically—as well as, to a large extent, historically—to southern Europe.

CHAPTER VI.

EUROPE.

GENERAL.

Position and Area.

120. Europe may be regarded from some points of view merely as a peninsula of Asia, and the name **Eurasia** has been coined to indicate the two continents considered as one.

There are, however, many reasons for considering Europe by itself as a separate continent. The civilisations of Europe and Asia have developed in strikingly different ways, and intercourse between them has been mainly by sea. Though there are no very marked physical boundaries, yet the two continents are separated partly by water (the Caspian and the Black Sea), and partly by a large area of barren and sparsely inhabited country; while the most fertile and densely inhabited regions lie almost at opposite extremities of the great land mass—in the south and east of Asia, and in the west of Europe.

The **area** of Europe is about 3¾ million square miles, or about thirty times the area of the British Isles. Nearly the whole of Europe lies within the **temperate zone**, as the Arctic Circle only cuts off a small area of northern Scandinavia and Russia, while the southernmost point of the mainland, Cape Tarifa, is about 12° north of the Tropic of Cancer.

On the east the physical boundary of Europe lies along the Ural Mountains and the Ural River, but neither of these coincides exactly with the political boundary, which is, however, unimportant.

In the south-east the whole of Caucasia is generally reckoned as Asiatic, though officially the northern part of it belongs to European Russia. On the west the extreme point of the mainland is Cape Roca, but the south of Ireland is about two degrees further west. The most northerly point is North Cape, about Lat. 72° N.

COASTS.

121. The **coast-line** of Europe is considerably longer, in proportion to its area, than that of any other continent. This, it is important to note, is due chiefly, not to minor indentations of the coast (though these are very numerous), but to **large inland seas**. Nearly the whole of Europe, with the exception of Russia, lies within about 300 miles of the sea.

In the north-west the chief indentations are the **North Sea**, **English Channel**, **Irish Sea**, and the **Baltic**, with its gulfs of Bothnia, Finland, and Riga. Except for a small portion of the Irish Sea, all these northern seas **are less than** 600 feet deep.

In the south the great depression of the **Mediterranean** separates Europe from Africa. It is divided into two deep basins by a **submarine** ridge between Sicily and Tunis. Through the small Sea of Marmora the Mediterranean is connected with the deep basin of the **Black Sea**. Further east is the entirely land-locked **Caspian Sea**, the surface of which is 85 feet below sea-level.

The west coast of Scandinavia is indented by innumerable large and small fjords; in front of them is a fringe of small islands, called the **Skerry wall**, which affords many sheltered water-ways along the coast.

The south and east shores of the Baltic, and the Atlantic coast from Jutland to Belgium are low, and generally bordered by **sand dunes**. The sea is encroaching on the land in many parts. On the Baltic coast are numerous large lagoons (" haffs ") lying behind sand-bars.

In the north-east of France the coast consists of **chalk cliffs** like those of the English shore opposite them. The Breton coast, like that of Cornwall, is high and rocky, with many natural harbours. In the south-west of France is another long stretch of sand dunes, encroaching on the land.

In the Iberian peninsula the coast is generally high, with few indentations or natural harbours, and an almost complete absence of islands. The Mediterranean coast is as a rule extremely rocky and picturesque, with numerous fine promontories and harbours.

CONFIGURATION.

122. Europe may be broadly divided into three regions:—(1) the **highlands** of the north-west, (2) the northern **plain**, (3) the **highlands** of the centre and south.

Northern Highlands.

123. The first of these regions consists of Scandinavia and north-western Scotland, two detached portions of a very **ancient plateau**, much denuded by ice and water. Each has a rocky fjord coast on the west, and slopes down into a plain on the south-east. As each of these regions is a physical unit, they will be described in more detail in later chapters.

The European Plain.

124. A great **plain** stretches without a break from the Bay of Biscay through northern France, the Low Countries, northern Germany, and Russia, to the Ural Mountains; it spreads north and south in Russia, from the White Sea to the Black Sea and the Caspian. From Berlin one could go to Paris, to Astrakhan, and to Archangel, almost in straight lines, without having to rise as much as 600 feet above sea-level.

The **rivers** of the western portion of the plain, from the Garonne to the Vistula, rise in the **central highlands** and flow in roughly parallel courses north-eastward to the Atlantic or the Baltic. Almost all of them have important ports at their mouths, and are navigable for considerable distances.

Further east the Russian plain swells up in the middle into a **low plateau**, from 600 to 1,100 feet in height, the northern part of which is known as the **Valdai Hills.**

This plateau, a large part of which is swampy, is a very **important watershed**, nearly all the large rivers of Russia rising there—the **Volga** and its chief tributary, the Oka, the **Don**, the **Dnieper**, and the **Western Dvina.**

The other rivers of western Russia rise on the eastern slope of the **Carpathians.** The rivers which rise in the **Ural Mountains**, though large, flow through barren country, and are relatively unimportant.

125. In north-west Russia, Finland, and north-west Germany there is a very extensive **region of lakes**, which have all been formed in hollows grooved out by ice, or in valleys dammed up by moraines. The chief lakes are **Ladoga** and **Onega** (the two largest lakes in Europe), Peipus and Ilmen.

Lake Ladoga drains into the Gulf of Finland by the short but large River **Neva**. Lake Onega has outlets both to Lake Ladoga and to the White Sea.

Finland is simply a **network of lakes** of all shapes and sizes. The lakes of the north German plain are quite small, and many of them have no outlet.

The Southern Highlands of Europe.

126. The **southern highlands** of Europe form a very complex group of mountains consisting of (*a*) the central highlands, and (*b*) the mountains of the three great southern peninsulas.

The **central highlands** consist principally of (1) the Alps, (2) a series of ranges forming approximately a semicircle convex towards the north, and having its centre near Venice. On or near the circumference of this semicircle lie the following ranges:—

Cevennes.
Auvergne.
Jura.
Vosges.
Schwarzwald (Black Forest).
Böhmerwald (Bohemian Forest).
Erz Gebirge.
Riesengebirge.
Carpathians.

This long line of almost continuous mountains faces on its outer side the great European plain; on the inner side it is separated by a number of smaller but important plains or valleys from the culminating range of the **Alps**, the highest mountains in Europe and the chief centre of radiation of rivers.

The central highland region shuts in **three lowlands** of great importance. By far the largest of these is the **great plain** of Hungary and southern Austria, between the Carpathians and the Alps. The other two are the comparatively narrow valleys of the **middle Rhine** and of the **Rhone-Saône**.

Immediately to the south of the Alps is a fourth lowland, the **Plain of Lombardy**, one of the most fertile regions in Europe.

The Alps.

127. There is no distinct line of demarcation between the Alps and the Apennines, though in every other direction the Alpine system is well defined. The **boundary** between Alps and Apennines is generally placed at a low pass, the Collo dell' Altare, a little west of Genoa. From here the Alps extend in a curve, first westward to the French frontier, then northward, and finally eastward through southern Switzerland and western Austria to the edge of the Danube valley.

There are **three** main divisions of the Alps, viz. (1) the **Western** Alps, from the Collo dell' Altare to the Great St. Bernard Pass; (2) the **Central** Alps, from the Great St. Bernard to the Brenner Pass; (3) the **Eastern** or **Austrian** Alps, including all the remainder.

The Western Alps contain the highest mountain in Europe, **Mont Blanc** (15,800 ft.). The chief heights of the Central Alps are **Monte Rosa** (15,217 ft.), the **Matterhorn** (nearly 15,000 ft.), the **Jungfrau** (14,000 ft.), and Mount **St. Gothard** (12,000 ft.); the last named, judging from the number of important rivers which flow from it, may be reckoned the centre of the whole Alpine system.

128. The **Passes of the Alps** are of great historical importance as routes both for commerce and war. Many of the lower passes had **roads** built over them in early times, and more recently **railways** have been constructed through several passes, generally by means of long **tunnels**. The **Simplon Tunnel**, 12¼ miles, is the longest in the world. In the following account of the more important passes, those which have railways over or through them are distinguished by an asterisk.

In the Western Alps the chief passes are those of **Genevra**, **Mont Cenis***, and the **Great** and **Little St. Bernard**. The first two of these are commanded on the Italian side by **Turin**; they diverge from the head of the Dora Riparia valley, the Mont Cenis Pass leading into the valley of the Arc (a tributary of the Isère), and the Genevra Pass southwestward into the valley of the Durance.

The passes of the Great and Little St. Bernard diverge from **Aosta** and lead respectively north and south of Mont Blanc to the valleys of the Rhone and the Isère.

Napoleon used the Great St. Bernard for the passage of his army into Italy in 1800.

129. The passes of the Central Alps are ranged at almost equal distances round **Milan**, and have made that town for centuries a centre of important routes, and the chief town of northern Italy.

The **Simplon Pass*** leads northwards from a tributary of the Ticino into the Rhone valley. Since the completion of the railway tunnel (1905) the Simplon is the most direct route between Italy and northern France.†

The **St. Gothard*** Pass leads from the upper Ticino into the valley of the Reuss, and is the most direct route from Italy to western Germany.

The **Splügen** Pass connects the head of Lake Como with the valley of the Hinter Rhein, and was in past times the most important northward route from Italy, leading past Lake Constance to Ulm on the upper Danube.

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† The first road across the Simplon was constructed by Napoleon.

451589

The **Brenner*** Pass has always been the chief route northward from Italy to Austria and Bavaria. It joins the valley of the Etsch or Adige to that of the Inn at Innsbrück. The Brenner is the lowest of the Alpine passes (4,600 feet), and the railway crosses it without any long tunnels.

130. The **lakes** of the Alps, so celebrated for their beauty, lie mostly on the outskirts of the mountain system. On the south side, on the edge of the Plain of Lombardy, are the Italian Lakes **Maggiore,** Lugano, **Como**, d'Iseo, and **Garda**.

On the north-west the Lakes of **Geneva** and **Neuchâtel** lie between the Alps and the Jura.

Due north of the Central Alps, on the Swiss plain, lie Lakes **Constance** (the largest of the Alpine lakes, about 200 sq. miles), **Zürich, Zug**, and **Lucerne**. The most central of the lakes are **Brienz** and **Thun**, lying under the great wall of the Bernese Oberland.

131. The most important **rivers** of the Alps are those which radiate from the St. Gothard. Two of these, the **Rhone** and the **Rhine** (Vorder Rhein), flow in broad longitudinal valleys in diametrically opposite directions. The **Ticino** flows southward into Lake Maggiore, and thence to the Po. The **Aar** flows north-westward through Lakes Brienz and Thun, and drains nearly all north Switzerland. Just before joining the Rhine it receives the Reuss, which has cut wild gorges through the mountains of Uri, before falling into Lake Lucerne.

Further east the **Inn** flows down the longitudinal valley of the Engadine and through the picturesque Tyrol to join the **Danube**, which receives two other large tributaries, the Drave and the Save, from the Austrian Alps.

The river **Po** rises in the Western Alps near Monte Viso, and receives all its northern tributaries from the Alps, the southern tributaries coming from the Apennines.

In the Ortler Group, the highest part of the Tyrol, rise the Adda and the Etsch or **Adige**. The former flows through Lake Como to the Po, and the latter runs direct into the Adriatic.

CLIMATE.

132. Nearly the whole of Europe, leaving out of account for the moment the southern peninsulas and the extreme north, lies between Lat. 45° and 65°, and is therefore in the belt of **Westerly Variables** or **Anti-Trade** Winds.

The drift of warm surface water north-eastward across the Atlantic, and the absence of high mountain ranges in the west, have a very favourable influence on the climate of **western Europe**—an effect increased by the moderating influence of the great inland seas.

Southern Europe is favoured by its lower latitude and also by the presence of high mountain barriers on the north and north-east, which protect it from cold winds.

133. Three climatic regions may be distinguished in Europe—or four, if we include the small part of northern Russia that has a true Arctic climate.

(1) **Western Europe** has an **equable** climate of mild winters and cool summers. The rainfall is very evenly distributed throughout the year, but is slightly greater in the autumn than in other seasons. The average annual rainfall varies from about 20 to 40 inches, but is greater than 40 inches on the western and southern slopes of mountains, owing to the prevailing winds.

(2) **Eastern Europe** has a smaller rainfall, occurring chiefly in the summer, and a much larger **annual range** of temperature, due chiefly not to hotter summers, but to much colder winters. The rainfall diminishes eastward and the range of temperature increases. The annual rainfall is less than 20 inches over nearly the whole of central and southern Russia, and there is a belt round the Caspian Sea where less than 10 inches of rain fall in the average year.

(3) **Southern Europe,** *i.e.* the Mediterranean basin, exhibits a sharp contrast to the other two regions, especially in the seasonal distribution of rain. The summer is hot and almost **rainless**, while the winter is **mild** and moderately wet. The total annual rainfall is generally between

20 and 30 inches, but is more in mountainous districts. Eastern and central Spain, however, are very dry, with a rainfall of less than 20 inches.

Isotherms.

134. In **winter** the general direction of the **isotherms** is from N.W. to S.E., owing to the warming effect of the sea on the western coast, while the whole of eastern Europe is very cold.

The **January isotherm** of 30° passes through Iceland, along the west coast of Norway, and through southern Sweden and eastern Germany to Buda-Pest and the mouth of the Danube.

The **isotherm of 50°** passes through central Spain, southern Italy, and southern Greece to Asia Minor; thus only the extreme south of the peninsulas and the Mediterranean islands have winter temperatures above 50°.

135. In **summer** the general direction of the **isotherms** is from S.W. to N.E., owing to the fact that the sea now has a cooling effect on the west coast, and that the south-east of the continent is the hottest part of it.

The **isotherm of 50°** has shifted from the extreme south to the extreme north of Europe, passing through Iceland and the North Cape.

The **line of 70°** runs from near Oporto to the Pyrenees, northward nearly to Paris, and then E.N.E., just north of Vienna and Kiev.

In central Spain, Italy, and the Balkans there are three small districts which have average July temperatures of over 80°.

VEGETATION.

136. Europe can be divided into **five** distinct regions of vegetation:—

(1) The extreme north-east of Russia consists of **tundras** or frozen marshes, with only a dwarf vegetation of moss and lichens. The reindeer is almost the only animal, and the very scanty population is nomadic.

(2) South of the tundras is a broad belt of **evergreen forests** composed chiefly of coniferous trees—fir and pine—of great value as timber. Forests of this kind cover most of Scandinavia and northern Russia, and are also found on the mountains of central Europe, few of which, except the Alps, rise above the tree-line.

(3) Further south again is a zone of **deciduous forest**, consisting of oak, elm, beech, etc.—also valuable timber trees. The deciduous forest at one time covered almost the whole of central Europe, but it has now been largely cleared to make room for agriculture, and in England has almost disappeared.

(4) The Mediterranean region was covered with **evergreen trees** of a distinctly different type from the northern forests; olive, cork, mulberry, laurel, and myrtle being among its characteristic forms.*

(5) The south-east of Russia is the only large area in Europe that is too dry for the growth of trees. Here we find the **steppes**, which extend from Russia right across central Asia, and consist of vast plains, treeless except near rivers, and varying from good pasture land to sheer desert. The people of the steppes are still largely nomadic, following their flocks from pasture to pasture, but agriculture is increasing in the more favoured parts.

137. Of the **cultivated plants** of Europe, by far the most important, of course, are the **cereals**.

Wheat is grown in the Mediterranean countries and in the deciduous belt as far north as the great lakes of Russia. **Barley**, which is a hardier plant, is grown from the far north of Norway, within the Arctic Circle, to the far south. **Rye** and **oats** grow in poorer soils and in damper climates than most other cereals, and are the chief crops of the German and Russian plain. **Maize** requires warmer summers and more summer rain than wheat, and is only extensively grown on the eastern side of the Balkan Peninsula (especially in Rumania) and in northern Italy (on irrigated land).

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* The reckless destruction of forests has caused great damage in Mediterranean countries, by making rivers more torrential and destructive, enabling them to wash away soil, and make once fertile slopes barren and rocky.

The characteristic **fruits** of central Europe are the apple, pear, plum, and cherry; of the Mediterranean countries the grape, olive, orange, lemon, and fig.

Of these last the **grape** can be cultivated considerably further north than any of the others. The northern limit of the grape vine runs approximately east and west from near the mouth of the Loire to that of the Volga.

POPULATION.

138. The inhabitants of Europe number about 400 millions, and of these fully 90 per cent. belong to that branch of the Caucasic race which speaks Aryan languages. Anthropologists commonly recognise only **two** European races:—(1) a tall, fair, long-headed race, found chiefly round the **Baltic shores**, and (2) a shorter, dark, round-headed race, found chiefly in **Mediterranean countries.** There has, however, been much admixture, especially in central Europe.

Differences of language, though not coinciding closely with physical differences, are from some points of view more important than the latter, as they often connote profound differences of character and habits. From this standpoint Europe can be divided into **three** parts, southern, northern, and eastern, inhabited respectively by the **Greco-Italic**, **Teutonic**, and **Slavonic** races.

The first two were in Europe at the dawn of history, while the Slavs are the legacy of a later immigration from central Asia, and have only in quite modern times grown into civilised political powers.

I. The Spaniards, Portuguese, French, Italians, and Rumanians speak **Romance** languages derived from Latin. The Greek branch is represented by the Albanians and Greeks. The **Celts** of Brittany, Wales, Ireland, and the Scotch Highlands are of kindred race, driven into remote highlands by the Teutonic invasion.

II. There are **three** principal branches of the Teutonic peoples: (1) **Scandinavians**, including Danes; (2) **Low Germans**, *i.e.* Germans of the plain, including Dutch, Flemish, English, and lowland Scotch; (3) **High Germans**, inhabiting southern Germany, northern Switzerland, and Austria.

III. The chief branches of the Slavs are the Russians, Poles, Lithuanians, Czechs (Bohemia), Croatians, Serbs (Servia), and Bulgarians.

The Finns, Lapps, and Samoyedes of the extreme north, the **Magyars** of Hungary, the **Tatars** or Tartars (Kalmucks, Kirghiz) of south-eastern Russia, and the **Turks**, who are merely an alien Asiatic garrison in Europe, are branches of the **Mongolic** or yellow division of mankind, and are quite distinct from all other Europeans.

The Tatars and the Lapps and Samoyedes are the only **nomadic** peoples in Europe. The former are pastoral, the latter live chiefly by hunting and fishing. In strong contrast to these, the Magyars and the Finns have attained a high standard of civilisation.

Of the six great powers of the world—Britain, Russia, Germany, France, the United States, and Japan—it may be noted that no less than **three** are inhabited by **Teutonic** peoples, while France, though owing much to Latin influence, has a strong admixture of Teutonic blood in the north. Italy and Austria-Hungary are officially reckoned among the "Great Powers," but they have little or no influence outside Europe, and their political importance is likely to decrease.

Distribution of Population.

139. The regions of continental Europe most densely populated are:—

(1) The **coastal** plain between the mouths of the Seine and the Rhine.*

(2) Nearly the whole **Rhine basin** from the mouth up to Basel, especially the industrial region on the Ruhr coalfield.

(3) The **Elbe** basin, especially Saxony.

(4) **Northern Italy,**—the basin of the River Po. Italy as a whole is nearly as densely populated as the British Isles.

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* This region has not only great textile and metal industries based on local and imported coal, but an immense transit trade from and to the fertile valleys behind it.

The regions of very scanty population, apart from actual mountains, are central Spain, Russia east of the Volga, and the whole continent north of about Lat. 60° N.

Only three countries in Europe, Russia, Germany, and Austria-Hungary have a population greater than that of the United Kingdom. They are followed in order of population by France, Italy, and Spain. These seven countries contain seven-eighths of the population of Europe.

Belgium, the most densely peopled independent country, has about one inhabitant for each of its seven million acres. No other country in Europe, besides those named above, has a population as large as that of Greater London.

BOUNDARIES.

140. The **boundaries** of the European states do not as a rule coincide closely with the main physical features or with divisions of race or language.

The most natural frontiers from a **military** point of view are **mountain** chains, which when either high or wide form a real and effective barrier; but the Pyrenees are the only important range in Europe which form a political boundary from end to end.

Rivers may also serve as natural frontiers, since, when of any size, they are difficult to cross in face of an opposing force.

On the other hand, rivers in early days were much more important as highways than they are now. Hence both sides of a river basin tended to be occupied by one tribe or nation, and **most river-frontiers** are the results of comparatively modern arrangements, though the Romans made the Danube and the Rhine their northern frontier.

The Danube at present is nowhere a boundary between states till it reaches Belgrade. It is not, however, under one control, but flows through two countries—or three, if Hungary be reckoned a separate country, as actually it is from many points of view. From Belgrade nearly to the sea the Danube is a boundary both politically and racially.

Excepting a small portion of the upper Rhine, neither the Rhine nor the Rhone, the two largest rivers of western Europe, forms a boundary; and both rivers are under divided political control.

Of the great rivers which form the only distinct natural lines of the northern plain, not one forms a boundary for any considerable distance; while the four largest rivers of Germany—the Rhine, Elbe, Oder, and Vistula—all have their sources (and in one case the mouth as well) outside Germany.

Hungary has a certain amount of unity as the basin of the middle Danube and the Theiss, closed in on the south-east by the Iron Gate, and on the north-west by the Hungarian Gate; but it has no natural frontier on the west.

Austria, on the other hand, has no kind of geographical unity. It includes regions so diverse as:—(1) a conventionally divided part of the Alps, (2) a small part of the Danube valley, (3) the Bohemian Plain (a natural unit), and (4) part of the great eastern plain (Galicia). It has **two** great disadvantages from a military point of view:—(1) an enormous land frontier, and (2) a short and rather inaccessible coast-line.

The southern peninsulas are most distinctly marked off as separate geographical units; but in the Iberian Peninsula we find the anomaly of the kingdom of Portugal, which, from a geographical point of view, has no right to a separate existence.

The Balkan Peninsula is much divided, and the mountains from which it takes its name run through the middle of Bulgaria instead of forming its boundary.

The political frontier of Italy coincides fairly accurately with its natural frontier, but the upper Ticino and the upper Adige, which ought to be in Italy, belong respectively to Switzerland and Austria.

EUROPEAN RAILWAYS.

141. Except in the far north (where, however, Archangel can now be reached by rail from Moscow), Europe is covered with a complex network of **railways**, of which only a few main through routes can be mentioned here. These should be compared with the accompanying map and then followed with an atlas *after* the more detailed description of Europe (Ch. XI. to XIII.) has been read.

The Pyrenees are the only large mountain range in Europe which has *not* been crossed by any railway.

Through the Alpine passes Italy is now connected with the north and west by **four distinct routes** (Brenner, St. Gothard, Simplon, and Mont Cenis).

The Erzgebirge and the Sudetes Mountains form serious barriers to communication between the populous .parts of Saxony and Silesia on one side, and Bohemia on the other. The **Elbe gap** in the former range, and the **Moravian Gate** at the south of the latter, are used for through routes from Berlin to Vienna, and from Vienna to St. Petersburg respectively.

The **Carpathians**, in proportion to their length, are crossed by fewer railways than the Alps; but this arises, not from any special difficulties of construction, but from the fact that they separate two regions of somewhat similar productions and rather scanty population.

Railway construction has been everywhere easy on the northern plain.

Paris and Berlin are decidedly the chief foci of main railway lines in Europe, and some of the more important international routes from them are summarised below. The lines from London to these towns are also given.

142. London to **Paris.**—(*a*) **Dover**, Calais, Amiens—the shortest sea passage. (*b*) **Folkestone**, Boulogne, Amiens—more direct. (*c*) **Newhaven**, Dieppe, Rouen (the Normandy route)—longer sea passage, but shorter rail on both sides of the Channel.

Paris to **Spain** and **Portugal.**—Nearly due south to the Loire at **Orleans**; down the Loire valley to **Tours**; south across the Charente and Dordogne to **Bordeaux**; through the Landes to **Bayonne** and **Biarritz**, and round the western end of the Pyrenees; through the gap between Pyrenees and Cantabrians to the Ebro valley (branch line to **Barcelona**); across mountains to **Burgos and Valladolid**; a few miles south of this the lines diverge to **Lisbon** and **Oporto** on the west and to **Madrid** on the south-east, across the Sierra de Guadarrama.

Paris to **Italy.**—(*a*) Via **Marseilles.** Through the Forest of Fontainebleau; up the Seine and Yonne valleys and through the Côte d'Or to **Dijon** in the Saône valley; down the Saône through **Macon** (junction for Mont Cenis route) to **Lyons**; alongside the

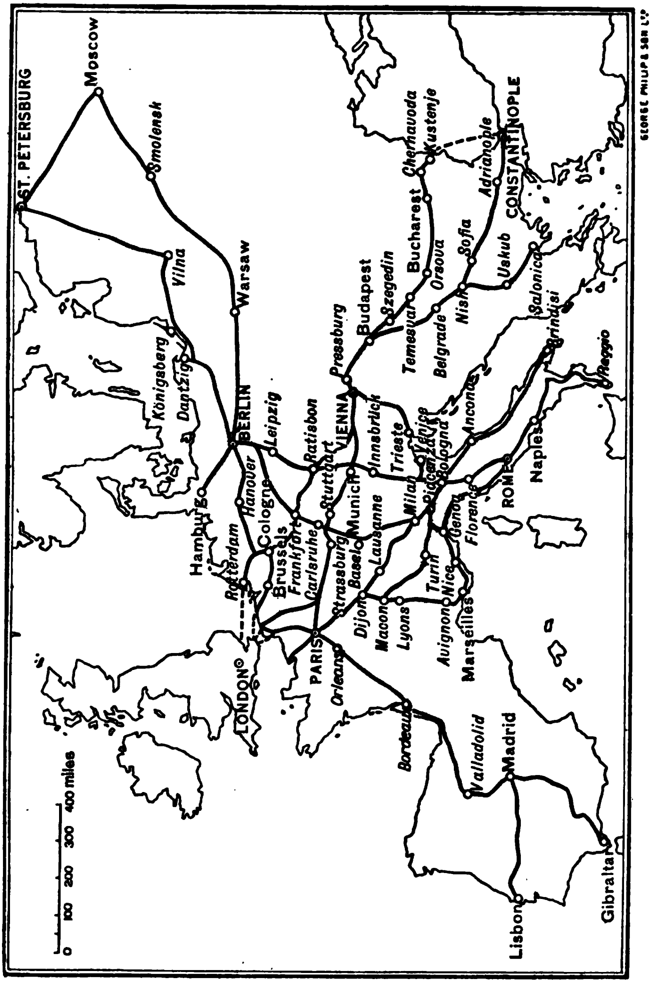

Fig. 47.—European Railways.

Rhone to **Avignon**, and thence south-east to **Marseilles**; along the coast, at the foot of the Maritime Alps, through **Toulon** to **Genoa** (along the Riviera) and the west coast railway of Italy (Spezia, Pisa, Rome, Naples, etc.).

(*b*) The **Mont Cenis** route. To **Macon** as above; south-east across the Rhone to **Chambéry**; across the Isère and up the Arc valley to Col de Fréjus (**Mont Cenis tunnel**, 7 miles long); down the Dora Riparia to **Turin** (branch to Alessandria and Genoa); on to **Piacenza** on the Po, where the line from **Milan** joins.

(*c*) The **Simplon** route (the most direct). To **Dijon** as above; across the Saône and Doubs (twice), and over the Jura to **Lausanne** on Lake Geneva; along the north bank of the lake, and up the Rhone valley to Brieg; **Simplon Tunnel**, 12¼ miles long; down by Lake Orta to **Milan**.

The lines from Milan and Turin converge at **Piacenza**, and run to **Bologna**, where the Brenner line from **Innsbrück** and **Verona** joins, and whence a line goes on to Florence and Rome; from Bologna the "overland" mail route to India runs to Rimini and thence close along the east coast through Ancona to **Brindisi**, whence mail steamers go to **Port Said** for the Suez Canal.

143. Paris to **Constantinople** (the **Orient Express**).—From Paris through Epernay, Châlons-sur-Marne (where a line from Calais via Reims joins), **Nancy**, and over the Vosges to **Strassburg**; across the Rhine and through the Schwarzwald to **Stuttgart** on the Neckar; across the Swabian Jura to the Danube valley at **Ulm**; across the Lech valley (**Augsburg**) and the Bavarian Plateau through **Munich**; rejoining the Danube at **Linz**, and thence following the river through **Vienna**, **Pressburg**, and **Buda-Pest** to **Belgrade**; up the Morava valley to **Nish** and **Sofia**, and down the Maritsa valley to **Adrianople** and **Constantinople.**

A new alternative route to Constantinople diverges from the above at **Buda-Pest**, and runs through **Szegedin** on the Theiss, and Temesvar; through the Iron Gate at **Orsova**, and through **Bucharest** to the Danube at Chernavoda; across the river to **Kustenji**, whence steamers reach **Constantinople** in 12 hours.

Paris to **Berlin**.—Through St. Quentin, **Charleroi**, **Liège** (where trains from **Ostend** join), **Aachen** (Aix-la-Chapelle), and **Cologne**; along the Rhine to **Düsseldorf**; through hilly country to **Hanover**, and across the plain to **Berlin.**

London to **Berlin**.—The most direct route is from **Harwich** to the **Hook of Holland**; through **Rotterdam** and **Utrecht**, and nearly in a straight line through Hanover. A slightly longer route is from **Queenborough** to **Flushing** (Vlissingen), and on through **Breda** and **Wesel** to Hanover; or from **Dover** through **Calais** or **Ostend**, joining the line from Paris at **Liège.**

Berlin to **St. Petersburg**.—Across the Oder at Küstrin, and north-east of Dirschau on the Vistula (20 miles south of **Danzig**); through **Königsberg** and nearly due east to **Vilna**; thence in a nearly straight line north-east to **St. Petersburg.**

Berlin to **Moscow**.—(*a*) From the above line, diverging at Düna-burg, via **Smolensk**. (*b*) From Berlin through **Posen**, Thorn (on the Vistula), **Warsaw**, Minsk, and **Smolensk**.

From **Berlin** southward the chief routes are (*a*) through **Dresden** and the Elbe gap to **Prague** and **Vienna**; (*b*) to Italy via **Leipzig**, **Ratisbon** (Regensburg), **Munich**, **Innsbrück**; through the Brenner Pass (longest tunnel only half a mile), and down the Adige to **Verona**, whence lines run west to Milan, east to Venice, and south to Bologna for Rome or Brindisi.

The **St. Gothard** route.—Several lines from south-west Germany, central and northern France, and the Low Countries, converge on **Basel**. From Basel the line runs south-east across the Swiss plain to **Lucerne**, round the north of the lake, and thence up the Reuss valley; through the **St. Gothard Tunnel** (9 miles), emerging into the Ticino valley. The line runs down this to Bellinzona, and thence, leaving the head of Lake Maggiore on the right, to Lugano; then across Lake Lugano and by Como to **Milan**.

CHAPTER VII.

THE BRITISH ISLES.

PHYSICAL RELATION TO EUROPE.

144. Though now severed from Europe by the Narrow Seas, the British Isles were **part of the mainland** in times geologically very recent—since the close of the great Ice Age. At that time the land extended continuously from Holland to beyond the west of Ireland, and from Belgium northwards to beyond the Shetland Islands, the coast-line coinciding roughly with the edge of what is now a submarine platform.

The **separation** of the British Isles was effected by a slight general subsidence of north-west Europe,—so slight that a rise of only 120 feet in the floor of the North Sea would again connect England with the Netherlands.

145. Thus Great Britain is really a detached portion of central and north-western Europe; while Ireland, as we shall see later, may be regarded as a detached portion of Great Britain.

The **plain** of central and southern England is merely a continuation of the great European Plain. As the latter is bordered on the north-west by the **Scandinavian plateau,** so the British plain is bordered on the north-west by the **Highland plateau** of Scotland, which reproduces on a smaller scale all the principal features of the Scandinavian Highlands.

The **chalk cliffs** of Kent and Sussex are exactly like those on the opposite shore of the Channel.

The **rocky peninsula** of Cornwall is paralleled on the mainland by that of Brittany.

The **Fen District** of England is very like the Low Countries opposite it, and the southern part of Lincolnshire, round the Wash, is significantly named **Holland.**

LAND RELIEF.

General.

146. Broadly speaking, nearly all the south and east of Great Britain consist of **lowlands**, nearly all the north and west of **uplands**. Ireland differs markedly from the larger island in the fact that its mountains are irregularly distributed on the rim of a roughly circular plain which covers the whole of central Ireland.

The uplands of Great Britain are arranged in seven groups, of which only one—the **Pennine Range**—has any resemblance to a true mountain range.

The others are the **Northern Highlands** and the **Grampian Highlands**, separated by the deep valley of Glenmore; the **Southern Uplands** of Scotland, the **Cumbrian Group** (or Lake District), the **Welsh Mountains**, and the **Devon-Cornwall** peninsula, which includes the three isolated uplands of Exmoor, Dartmoor, and the Bodmin moors.

The Scottish Highlands.

147. The **Highlands** of Scotland form one of the most sparsely inhabited and most inaccessible regions in all Europe. The "grain" of the land runs from north-east to south-west, and most of the chief valleys or glens follow this direction approximately.

There is only one important transverse valley opening into the rich and fertile lowlands of Scotland. This is the valley of the Garry-Tay, which until recently was the only route, either by road or rail, through the central Highlands.

The Highlands are an **ancient plateau** of granite and gneiss, deeply cut into by rivers, many of which expand into long narrow lakes of great beauty.

Glenmore, or the Great Glen, is a long trench cut right across Scotland from the Moray Firth to Loch Linnhe. Its lakes, Loch Ness, Loch Oich, and Loch Lochy, have been joined by the **Caledonian Canal**, affording a passage for small vessels.

The so-called "Grampian Mountains," which are so prominent a feature of the northern landscape of the Scotch lowlands, are not a true mountain range, but merely the steep south-eastern edge of the plateau, looking down on the fertile low-lying valley of Strathmore.

148. The Grampian Highlands are almost cut in two by the deep, narrow valley of the Dee. To the south of this lies the long ridge called the **Mounth**, which rises near the sea at Stonehaven and extends in an unbroken line to the Pass of Drumochter, at the head of Glen Garry. No railways and hardly any roads cross this ridge, the highest point of which is Lochnagar.

Further north, between the Dee and the upper Spey, lies the greatest mass of high ground in the British Isles. Its chief summits are **Ben Macdhui** (4,296 ft.), Braeriach, Cairntoul, and Cairngorm.

Slightly higher than any of these is **Ben Nevis** (4,406 ft.), which lies considerably further west, near the head of Loch Linnhe.

On the western coast the Highlands descend abruptly to the sea. On the east coast, however, there is a **low coast plain**, about ten miles wide as a rule, but wider in Aberdeenshire and Caithness, and much narrower in Sutherlandshire and Stonehaven. Nearly the whole population of northern Scotland is confined to this lowland sill of the north-east, especially in Aberdeenshire.

The Scottish Lowlands.

149. These form a plain from 40 to 50 miles wide, extending right across the country from north-east to south-west.

The plain is diversified by a number of isolated ridges running in a line with the general "grain" of Scotland, *i.e.* from north-east to south-west. These are the **Sidlaw** and **Ochil Hills**, the peninsula of Fife, and Campsie Fells.

The plain is deeply intersected by three **important estuaries**, the Firths of Tay, Forth, and Clyde. The rivers flowing into these all occupy transverse valleys.

The Central Uplands.

150. South of the Scottish Lowlands are the **Central Uplands** of Britain, divided into three blocks by two narrow gaps of lowland—the **Tyne gap** and the **Aire gap**.

The three blocks are (1) the **Southern Uplands** of Scotland and the **Cheviots**, (2) the **Cumbrian** Mountains and the **Pennines** north of the Aire, (3) the **Southern Pennines** and the **Peak**.

The southern uplands of Scotland are cut right in two from north to south by the transverse valley of the Nith, and the valley of the Teviot-Tweed almost severs them from the Cheviots.

In the same way the low valley of the Eden almost separates the Lake Mountains from the Pennines. The two are, however, connected round the head of the river by the broad ridge of **Shap Fell**, 1,000 feet high.

These uplands are much lower, less continuous, and less rugged than the Highlands. It is only in the Cumbrian group that there is any approach to the grandeur of Highland scenery.

Elsewhere the uplands consist chiefly of round-topped grassy hills and heather moors. The valleys are wider, and there are far fewer difficulties of communication.

The Welsh Uplands.

151. The **Welsh Uplands** form a block of high land extending from Great Orme's Head to the plain of Glamorgan, the highest point being **Snowdon** (3,570 ft.).

The chief heights and the main watershed lie near the west coast, and all the principal rivers—Dee, Severn, Wye, Usk—flow eastward at first, their valleys cutting deep into the mountains, and making communications east and west much easier than those north and south; so that a traveller from Swansea to Carnarvon goes by way of Hereford, Shrewsbury, and Chester.

Anglesea and the peninsulas of Carnarvon and Pembroke are lowland, and there is a coast plain some ten miles wide in South Wales.

Devon-Cornwall Peninsula.

152. The uplands of the south-west of England—in the **Devon-Cornwall** Peninsula—are in three isolated blocks, much smaller than any of those hitherto mentioned.

The most northern one is composed of the **Quantock** and Brendon Hills, and **Exmoor Forest** (which is treeless except in the glens or "combes").

Nearly due south of Exmoor is the higher and more rugged granitic upland of **Dartmoor**, one of the most desolate regions in England.

Further west is the much smaller **Bodmin Moor.** Beyond this Cornwall is lowland, though bounded by a wild and precipitous coast.

The English Plain.

153. Apart from the highland regions previously mentioned—Cumberland, the Pennine Range, Wales, and Devon-Cornwall—England consists **almost wholly of lowland.** But there are several important minor uplands and varieties of soil and surface (as well as of climate) which give considerable diversity to English scenery, and also to the occupations of the people.

The Oolitic Escarpment.

154. A curved line drawn from the mouth of the Tees to the mouth of the Exe (Fig. 48), and slightly convex towards the east, divides England into two regions of distinct character and structure. It is not an imaginary line, but a distinct ridge of limestone, known as the **Oolitic Escarpment,** the steep face of which is towards the west and north-west.

This ridge is known in different parts by the following names:—

Blackdown Hills.
Mendip Hills.
Cotswold Hills.
Edge Hill.
Northampton Heights.
North York (or Cleveland) Moors.

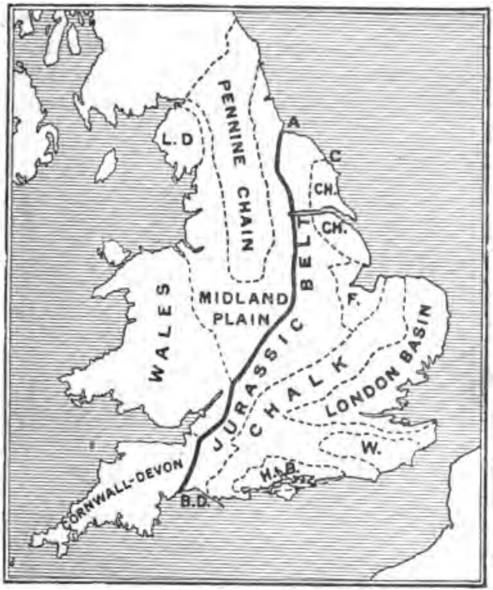

Fig. 48.

AB, Oolitic Escarpment; *CD*, Cretaceous Escarpment; *LD*, Lake District; *CH*, Chalk; *F*, Fens; *W*, Weald; *HB*, Hampshire Basin.

It is broken through by the **Humber estuary,** and also by the Yorkshire Derwent and the Bristol Avon. The latter river cuts through the limestone in narrow gorges at Bath and at Clifton.

The Cretaceous Escarpment.

155. To the east of the Oolitic Escarpment, and roughly parallel with it, is a ridge of chalk, known as the **Cretaceous** (or Chalk) **Escarpment.** (Figs. 48, 49.)

The escarpment is formed by the following heights:—

Dorset Downs.	East Anglian Heights.
Marlborough Downs.	Lincolnshire Wolds.
Chiltern Hills.	Yorkshire Wolds.

Between the Dorset Downs and the Marlborough Downs it crosses Salisbury Plain. It ends in Flamborough Head.

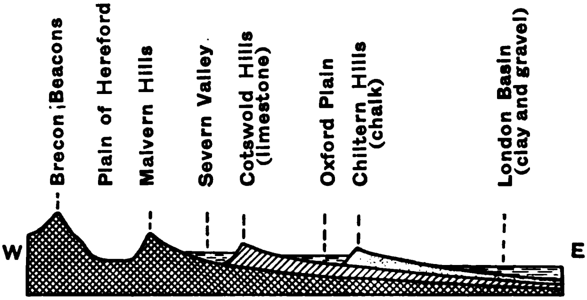

Fig. 49.

SECTION FROM BRECKNOCKSHIRE TO ESSEX.

▩ = Old Igneous Rock.

▨ = Limestone.

░ = Chalk.

☰ = Recent Clays and Gravels.

The chalk belt is cut through by two inlets, the **Wash** and the Humber, both of which are bordered by **recent** alluvial soil, which also extends along the east coast of Lincolnshire. Numerous rivers have also cut passages through the chalk. The chalk belt is **mainly pastoral,** as the thin soil produces excellent short turf, but little else.

The Jurassic Belt.

156. This is a **fertile plain** of **clay** lying between the two escarpments just mentioned. (Figs. 48, 49.) It slopes on the whole very gently to the south-east, and includes the valleys of the upper Thames, the Bristol Avon, and the rivers which flow into the Wash.

The Jurassic Belt is mainly agricultural, but its minerals are also important. **Building stone** is found at Portland, Bath, and other places, **iron ore** in Northamptonshire and in the Cleveland district, and **clay** for bricks almost everywhere.

The Fens.

157. Lying round the shallow inlet of the Wash are the **Fens**, the flattest part of Great Britain. Till the seventeenth century the Fens were almost impassable marshes, with a few gravelly mounds, forming sites for small market towns. The marshes have now been almost completely drained by canals and dykes, and the region consists of good arable land, though there are still patches of unreclaimed fen.

The Downs.

158. In the north of Hampshire, to the east of Salisbury Plain, the chalk belt divides into two nearly parallel ridges—the **North** and **South Downs**.

The **North Downs** run nearly due east, broadening out in Kent, and reaching the sea in the North and South Forelands. To the north of them lies the **London Basin**, and to the south the **Weald** (*q.v.*). The steeper slope faces south.

The rivers flowing northward from the Weald into the Thames have cut deep, narrow gaps through the North Downs—the Wey at Guildford, the Mole at Dorking, the Dart at Sevenoaks, the Medway at Maidstone, and the Stour between Ashford and Canterbury.

These gaps are important as furnishing easy routes for both roads and railways southward from London.

The **South Downs** also run east from Hampshire, south of the Weald, ending in the cliffs of Beachy Head. The south-flowing rivers of the Weald—Arun, Adur, Ouse, and Cuckmere—have also cut through the South Downs deep gaps, which are traversed by the railways to the south coast.

The Weald.

159. The **Weald**, lying in Kent and Sussex between the North and South Downs, is a **shallow oval basin** with an uplift in the middle. (Figs. 48, 50.) It was once a dome covered with chalk, but the upper layers of chalk and greensand have been stripped off by erosion, exposing the harder Wealden sandstone which now forms Crowborough Beacon and Forest Range, the watershed in the middle of the Weald.

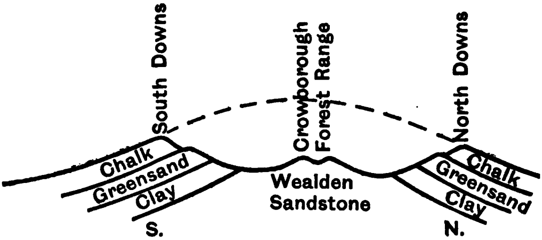

Fig. 50.

SECTION THROUGH THE WEALD FROM SOUTH TO NORTH.

The Strait of Dover has cut through the eastern part of the Weald, so that there is a small continuation of this plain on the mainland, in north-east France.

The sea-coast of the Weald, between Eastbourne and Folkestone, is a **low plain** of recent formation, which has turned the old ports of Pevensey, Rye, and Winchelsea into inland towns, and has built up the shingle cape of Dungeness in front of Romney Marsh.

The Weald, as its name implies, was in early times densely forested, but is now a region of hop-fields, market gardens, and orchards.

The Hampshire Basin.

160. This (Figs. 48, 51) is a low plain in which the chalk has not been eroded, as in the Weald, but covered up with more recent tertiary rocks—clays and gravels.

The chalk which lies below the Hampshire Basin reappears in the centre and south of the Isle of Wight.

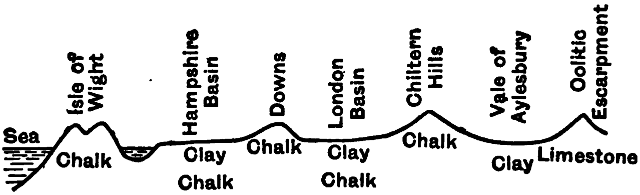

Fig. 51.

SECTION N.N.E. FROM THE ISLE OF WIGHT TO THE OOLITIC ESCARPMENT.

The coast is low and much indented, containing the inlets of Poole Harbour, the Solent, Spithead, Southampton Water, and Portsmouth Harbour.

In the south-west of this region is the **New Forest**, the most extensive area of woodland left in England.

The London Basin.

161. This (Figs. 48, 51) is a **shallow depression** in the chalk, covered, like the Hampshire Basin, with clays and gravels, but much larger in area. It extends from the valley of the Kennet, along both sides of the lower Thames, between the North Downs and the Chilterns, and widens out towards the sea, reaching from the north coast of Kent to Cromer in Norfolk.

The coast is low and indented with numerous shallow estuaries, of which those of the Thames, Blackwater, and Orwell are the chief.

The soil is fertile and was originally well wooded, till forests gave way to agriculture. The **best wheat-land** in England is found in Norfolk and Suffolk.

RIVERS AND WATERSHEDS OF GREAT BRITAIN.

General.

162. As the uplands of Great Britain lie nearer to the west coast than to the east, the rivers of the west are necessarily, on the whole, shorter than those of the east. The only important exception is the **Severn**, but this flows east at first, and nearly all its tributaries also flow east, only one considerable tributary—the Warwick Avon—flowing westward to the Severn.

The main watershed of Great Britain divides the rivers into **three** groups, viz. those which flow into (1) the **eastern** sea, (2) the **western** sea, (3) the **southern** sea.

Scottish Rivers.

163. The watershed is a sinuous line from Duncansby Head, running first west and then south near the head of the western sea-lochs of the Highlands. It nearly bisects Glenmore, between Loch Lochy and Loch Oich, and then runs south again between Loch Lomond and Loch Katrine, the former of which discharges into the Clyde, the latter into the Forth.

The **Clyde** basin is the only important river basin in Scotland to the west of the main watershed, the western Highlands having only short torrential streams.

From the head waters of the Clyde a minor watershed runs south-west into Galloway, separating the Dee, Nith, and Annan, which flow into Solway Firth, from the short rivers of Ayrshire.

The **eastern slope** of Scotland is cut up into river basins by minor divides running roughly east and west.

The chief rivers, from north to south, are as follows :—

Shin,
Conan,
Ness,
Spey (96 miles),
Don,
Dee (87 miles),
North Esk,
South Esk,
Tay (100 miles),
Forth (60 miles),
Tweed (96 miles).

The Tay is the largest river in Scotland, but it is too rapid to be navigable above tidal water. Its chief tributary is the Garry, on the left bank. Glen Garry is the true continuation of the lower Tay valley; the upper Tay ought, strictly, to be reckoned as a tributary of the Garry (cf. Thames and Kennet, § 167).

The Pennine Divide.

164. The broad belt of upland running south from the Cheviots to the Peak is the main divide of northern England. The actual water-parting is much nearer the western than the eastern edge of the hills, the eastern rivers running through the uplands in long deep valleys, here called " dales."

The chief rivers on the west are the Eden, Lune, **Ribble**, and **Mersey** (68 miles). On the eastern slope are :—(*a*) several rivers with nearly parallel east and west courses —the Aln, Coquet, **Tyne** (70 miles), **Wear** (80 miles), and **Tees** (73 miles) ; (*b*) the rivers which flow into the Humber.

The **Tyne** is the most important river of north-eastern England. It is formed by the confluence of the North and South Tyne near Hexham. The northern branch flows southward from the middle of the Cheviots. The South Tyne rises near Cross Fell, the highest point of the Pennines, from which the headwaters of the Wear and Tees also diverge.

The valley of the South Tyne is connected with that of the Irthing, which joins the Eden above Carlisle. The combined Tyne-Irthing valley is the **only lowland route** across the Pennines north of the Aire Gap, and is naturally followed by the railway from Newcastle to Carlisle.

Hadrian's Wall, 122 A.D., also followed the Tyne Gap. **Wallsend**, known chiefly in connection with coal, has a name which commemorates the old Roman Wall.

165. The group of rivers which flow into the **Humber estuary** drains a larger area than any other single river-system in the British Isles. There are **two** main parts of the system—the basins of the **Trent** (150 miles) and the **Yorkshire Ouse** (120 miles).

The latter river, formed by the confluence of the Swale and Ure, receives above York the Nidd, and below York the Wharfe, Aire-Calder, and Don on the right, and the Yorkshire Derwent on the left.

The Derwent is not a Pennine river at all. It rises in the North York Moors within about five miles of the coast, but flows inland through the Vale of Pickering into the Vale of York.

The **Aire** valley is important as the only route across this part of the Pennines which does not rise to 500 feet. The **Aire Gap** leads above Skipton into the valley of the Ribble by way of Colne and Burnley.

The Calder valley and its tributary valley of the Coln also furnish somewhat more difficult routes across the Pennine Range. All three routes are followed by canals as well as by railways.

The river **Trent** describes roughly a semicircle through the Midland Plain of England. Its left-bank tributaries, of which the **Derwent** is the longest, rise in the Peak district in very picturesque valleys.

From the junction of the **Soar** northwards the Trent flows near the Oolitic Escarpment, and therefore its right-bank tributaries are few and small.

The **watershed** between the Trent and the Severn lies a few miles west of Birmingham, and runs through the heart of the "Black Country."

The Trent is navigable by barges to Burton, and by steamers to Gainsborough.

Minor Rivers of the East.

166. Between the Oolitic and the Chalk Escarpments and over the dead level of the Fens a number of rivers flow through a rich arable district. These are the Witham, Welland, Nen, and **Great Ouse** (145 miles). In Norfolk the Yare, Bure, and Waveney unite at Yarmouth, and the shallow lagoons which these rivers form are the celebrated **Norfolk Broads**. Further south the Stour and Blackwater flow into the North Sea in small estuaries similar in character to that of the Thames.

The Thames Basin.

167. The basin of the **Thames** (215 miles) really consists of two distinct basins joined near Reading by a narrow gap in the chalk ranges. Of the upper valley **Oxford** is the natural centre and the only important town. The Windrush, Evenlode, Cherwell, and Thame join the river on the north above **Reading**.

Below Reading, on the same side, are the Colne, Brent, Lea, and Roding. On the right bank the first important tributary is the Kennet, the valley of which is the true continuation of the lower Thames valley.

Below Reading all the southern tributaries of the Thames flow in from the Weald, and have been already mentioned.

The Welsh Divide.

168. As in the case of the Pennine Range, the watershed of Wales—the **Welsh Divide**—lies near the western edge of the mountains, and consequently the rivers flowing into Cardigan Bay are small and unimportant, the watershed being only about twenty miles from the coast.

Just south of Lake Bala, the only considerable natural lake in Wales, the watershed turns abruptly to the east, separating the basin of the Dee from that of the Severn.

On the south and east of the Welsh Divide the chief rivers are the **Severn**, **Wye**, **Usk**, Taff, Neath, and Towy, all flowing into the "Severn Sea."

169. The **Severn** (220 miles) rises in Plynlimmon, close to the source of the Wye. It has only two considerable tributaries above the estuary. These are the **Teme**, from the central uplands of Wales, and the Warwick **Avon**, from the middle of the Jurassic Escarpment near Naseby.

Leaving the mountains at **Welshpool**, the head of navigation, the Severn flows through a broad low valley to **Shrewsbury**. A few miles below this, at Coalbrookdale, the valley becomes much narrower, having the isolated peak of the **Wrekin** to the north, and the straight ridge of Wenlock Edge at right angles to the river on the south. The valley remains comparatively narrow, between the Black Country on the left and the Clee Hills on the right bank.

From **Kidderminster**, a few miles up the Stour, to **Gloucester**, the Severn valley is again wide and flat, but below Gloucester the valley is once more constricted by the near approach of the Cotswold Hills on the left bank, and, on the right bank, of the table-land the northern part of which is called the Forest of Dean.

This limestone table-land has been bisected by a beautiful deep gorge cut through it by the **Wye** between Monmouth and Chepstow.

The middle valley of the **Wye** (135 miles), in Herefordshire, is a broad very fertile plain, famous for its **orchards** and **cattle**. It is isolated by the **Malvern Ridge** from the plain of the Severn.

The other rivers of South Wales, of which the chief are the **Usk** and the **Taff**, radiate from the neighbourhood of Brecon Beacons.

The upper valley of the Vyrnwy, one of the small head streams of the Severn, has been converted by Liverpool into a large lake-reservoir.

The Southern Watershed.

170. In north Wiltshire the main watershed of England divides into two branches, running east and west to the South Foreland and to Land's End respectively. On the east side the rivers of the Weald have already been mentioned. As we go westward from the Weald, the chief rivers flowing south are:—

Itchin,	**Exe** (55 miles),
Wiltshire Avon,	Teign,
Stour,	Dart,
Frome,	**Tamar,**
Axe,	Fowey,
Otter,	Fal.

Southampton Water, the estuary of the Itchin, is of importance because of the great port of **Southampton,** lying behind the sheltered waterways of Spithead and the Solent.

The **Exe** runs nearly due south from within a few miles of the Bristol Channel to Exmouth, and has the ancient cathedral city of Exeter at the head of its estuary.

The **Tamar** is only of importance because of the magnificent harbour at its mouth, round which have been built the "Three Towns" of **Plymouth, Devonport,** and **Stonehouse.**

Further west the Fal also expands into a fine harbour, on which stands the minor port of **Falmouth.**

North of the main divide of the south-west of England the only rivers of any size are the **Bristol Avon,** Parret, Tawe, and Torridge, the two last uniting in a common estuary at Barnstaple Bay.

CLIMATE.

Winds.

171. The British Isles lie in the belt of "Westerly Variables," and therefore the prevailing wind is **south-west,** especially in winter. The winds are weaker and more variable in summer. East winds are most common in April and November.

Many **cyclones** pass over or near the British Isles in the course of a year. The most common storm-track is on a north-east line just outside the north-west of Ireland and Scotland. Other storms pass south-eastward across the Bay of Biscay and southern France, and a few pass up the English Channel or across southern England.

The region of fewest storms is on the east coast of Great Britain, between the Wash and the Firth of Forth.

Temperature.

172. In July the **isotherms** of the British Isles run on the whole east and west, but, as the land is warmer than the sea, they are bent northward on the land and southward on the sea, taking roughly the shape $\overset{\frown}{A}{}_{B}\overset{\frown}{C}$; A represents Ireland, B the Irish Sea, and C Great Britain.

The **warmest** part of the whole region in summer is near London, where the average July temperature is 64°. On the south coast the relative coolness of the sea brings the temperature down to about 61°. In the north of Scotland the temperature is about 56°.

The summer **isotherm of 60°** encloses the south-eastern quadrant of Ireland, and passes through Wales, Westmoreland, and north-east Yorkshire.

In **winter** the distribution of temperature is quite different; the isotherms run on the whole north and south, and temperature diminishes from west to east.

The **January isotherm** of 40° passes southward through the west of Scotland and the east of Wales, and then turns eastward to the Isle of Wight. The **coldest** districts (38°) are the East Anglian counties of England and the east of Scotland.

The extreme south-west of England and of Ireland have average January temperatures of over 44°.

Rainfall.

173. The rainfall of the British Isles diminishes on the whole from west to east. There are two distinct reasons for this: (1) the western border of the islands lies nearer the usual track of cyclonic storms; (2) all the chief uplands lie near the western border.

In **Ireland**, owing to the absence of large tracts of upland, the distribution of rain is more uniform than in Great Britain. In the west of Ireland the average annual rainfall is a little over 40 inches, and in the centre and east between 30 and 40 inches.

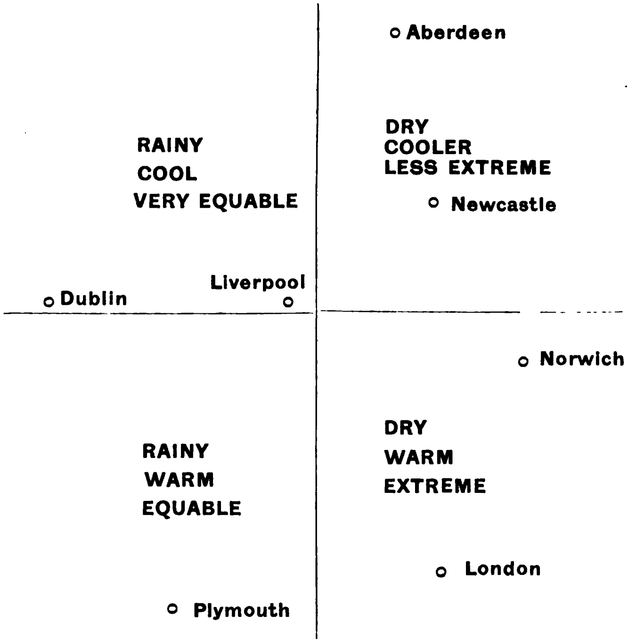

Fig. 52.

Climatic Regions of the British Isles.

In Great Britain the whole of the Western Highlands, and most of the Southern Uplands, the Cumbrian Mountains, the Pennine Chain, Wales, and the uplands of Devon and Cornwall have an average annual rainfall of over 40 inches. In some small districts this is far exceeded.

Thus both at Ben Nevis and Scafell the average annual rainfall is over 100 inches.

On the English Plain and in the east of Scotland the rainfall is everywhere less than 40 inches, and is less than 30 inches over a tract extending from London to Edinburgh, wide in the south and narrowing towards the north.

The **driest** part of the whole islands is a district between the Humber and the lower Thames, with an average rainfall of less than 25 inches. This is due to (1) absence of high land, (2) distance from the usual track of storms.

Fig. 52 illustrates **four climatic regions** into which the British Isles may be roughly divided, and the character of their climate.

The word "extreme" as applied to the south-eastern quadrant only means extreme relatively to the rest of the British Isles. Compared with most continental countries, the south-east of England has a **very equable** climate. The annual range of temperature at London is less than half what it is at Moscow.

There are no marked contrasts in the **seasonal distribution** of rain in the British Isles; there is nothing approaching a "dry season" at any time of the year. In Ireland and Western Scotland the rainiest months are December and January. In the remainder of the region October is usually the rainiest month.

Vegetation and Animals.

174. In very early days Great Britain was **densely wooded** in all the low-lying parts; but the forests were mostly destroyed many centuries ago, for fuel, for building, and to clear the ground for agriculture. Less than 4 per cent. of the total area is now covered by woods.

The most extensive **woodlands** now remaining are in Scotland, Hampshire, Sussex, and Kent. There are many orchards in the Severn Valley, and in Somerset and Devon.

The following table shows the percentage areas of different kinds of land in each of the four countries which compose the United Kingdom:—

	England.	Wales.	Scotland.	Ireland.
Uncultivated (mountain, water, etc.)	12	12	22	23·5
Woods	5	4	4·5	1·5
Rough pasture (moorland, heath, etc.)	7	25	48·5	52
Crops and grass	76	59	25	23

Of the total area about one-tenth is occupied by the **cereal** crops, wheat, barley, and oats. More than half of the cereal area consists of oats, and the remainder is about equally divided between wheat and barley.

Wheat is a steadily diminishing crop, and is only grown on a large scale in eastern England. **Barley** is grown largely in the English Midlands and the east of Scotland, and **oats** are grown everywhere.

Roots and **clover**, which are important as winter food for cattle, are grown everywhere, but especially in Scotland, owing to the scarcity of good pasture there.

Potatoes are grown in all districts, but especially in Ireland, in the north of which **flax** is also an important plant. **Hops** are grown almost exclusively in the Weald and in the Severn and Wye valleys.

One of the many economic effects of climate can be seen in the fact that in Ireland there are more cattle than sheep, while in Great Britain, which on the whole is distinctly drier, the sheep outnumber the cattle by more than four to one.

In Great Britain **cattle** are reared most extensively in the rainy western peninsulas—Wigtown, Carnarvon, Pembroke, and Devonshire—and on the low-lying wet pastures of the English Plain, especially in Cheshire and the middle of the Jurassic Belt.

Sheep thrive better on higher ground and poorer pastures. They are reared in largest numbers on the Southern Uplands of Scotland, on the Pennine Range, in Wales, and on the chalk downs of south-eastern England.

CHAPTER VIII.

ENGLAND AND WALES.

TOWN SITES.

175. Before describing English towns and districts in somewhat fuller detail, it will be well to discuss some of the chief **geographical causes** which lead to the growth of towns in particular positions, not only in England, but all over the world.

River Towns.

176. The sites of very many towns are determined by the **courses of rivers.** A river provides a usually steady **water supply** for drinking or for irrigation (though in modern times most English rivers have become quite unfit for drinking). Most rivers of any size are more or less **navigable**, and hence provide easy routes either upward into the interior of a country or downward to the sea. In cases where rivers have natural falls or can be easily dammed, their **water-power** may become important for **industrial** purposes. Finally, a town on one side of a river was, at any rate in mediaeval times, **more easily defended** than one entirely surrounded by land.

Where a river makes a loop, the advantage of the situation for defence is still more obvious. Durham is a good example.

177. Under the heading of river-towns may be enumerated four different classes of towns, of which many examples will be found in this and later chapters.

(1) A **commercial** town naturally arises at the **head of navigation** on a river, *i.e.* at the highest point that ocean-going ships can reach; for it is obvious that here goods

from foreign countries must be disembarked, and that this is a natural centre of collection for goods intended for foreign countries.

(2) **Bridge-towns** arise at the **lowest** place at which a river can be bridged, since they command the lowest route across the river, as well as the route up and down the river.

(3) **Confluence-towns** arise where a considerable tributary flows into the main stream, as they command **two divergent** routes. Examples—Oxford, Coblenz (Latin *confluens*), Khartum, St. Louis.

(4) **Rapid-** (or cataract-) **towns** arise at or near the foot of natural falls, partly because of the **water-power** available, and partly because a waterfall marks a definite limit to navigation of any kind (unless evaded by a canal). Among cataract-towns may be mentioned Aswan and Minneapolis.

It may be noted that bridge-towns frequently coincide with the head of navigation on a river, and are important in both ways. London is a case in point.

Such names as Cambridge, Oxford, Hereford, Bridgwater, Innsbrück, and many others, indicate the early importance of places where rivers could easily be crossed.

178. The increasing size of sea-going ships has caused many **old ports** on rivers to be wholly or partly **superseded**, as ports, by towns lower down the river.

The older town, however, generally retains a good deal of its importance as a **business centre**, but the actual handling and shipment of goods is transacted at the "outport." Thus the **Port of London**, which was once practically in the City, now extends for many miles down the river. The port of **Bristol** is now at **Avonmouth**, several miles from the town of Bristol.

On the other hand the artificial deepening or canalisation of a river may revive an old port high up the river, or create a new one. **Rouen** is now a large port, actively competing with Havre. **Glasgow** owes its rank as a seaport entirely to the deepening of the Clyde.

Route Towns.

179. Towns tend to grow on **plains** at the edge of mountain ranges, and especially at the foot of **easy routes** or **passes** across the mountains.

Such places are of obvious **military** importance (*e.g.* **Turin, Peshawar**) and sometimes become large commercial towns: **Leeds** owes part of its importance to its situation at the foot of the **Aire Gap**, on the edge of the Vale of York.

Towns on **straits** become important as **ferry-towns** and also as places of call for ships passing through the straits. They are also sometimes important naval stations. **Dover, Gibraltar, Aden, Constantinople** may be mentioned as strait-towns.

Naval Ports.

180. Towns with fine **natural harbours** do not become **commercially** very important unless they have behind them a very **productive** or rich **industrial area.** Thus **Plymouth, Portsmouth,** and **Pembroke** are important solely as **naval** stations, because of their distance from industrial England.

Industrial Towns.

181. In modern times the growth of large towns has been very largely determined by the **presence of coal and iron**—the raw materials required for almost all manufactures. With hardly any exception all the large towns of the United Kingdom are either **seaports** or are situated on or very near to **coal-fields.**

A modern industrial centre like **South Lancashire** or the "**Black Country**" is a **cluster of towns** of all sizes—often within a century developed from quite small villages—closely linked together by railways, roads, and tramways, and forming in effect one huge urban community. One town of the group, from its central position or some other advantage, tends to become the **commercial centre** of such a region, while the other towns restrict themselves mainly to manufacture.

Thus **Manchester** is not now so much a **manufacturing** as a **commercial** town, the cotton manufacture being principally carried on in the ring of towns round it; but the raw materials and the finished products are bought and sold in Manchester.

Concurrently with the growing complexity of machinery and the division of labour, towns tend more and more to **specialise** in some particular branch of industry. This is strikingly exemplified by the recent enormous growth of cycle and motor works in **Coventry**.

Capitals.

182. Though the sites of most **capitals** were originally determined more or less by **geographical** circumstances, the mere fact that a town has become a **seat of government** tends to make it a large town, independent of any geographical advantages.

Apart from the large number of people directly employed in government services, the capital almost inevitably becomes a centre of scientific, literary, and artistic life, as well as of fashion and luxury, with the trades and manufactures dependent on these.

183. It is not always possible to state any geographical reasons for the **exact** site of a town, as distinguished from its **general** situation. There is no obvious reason why, for instance, **Berlin** and **Moscow**, on the great European Plain, or **Madrid**, on the Spanish Meseta, should have grown up exactly where they have. These places owe something to the **general** advantage of their central situations, but the **exact** site would appear to be more or less accidental.

Pleasure Towns.

184. A number of towns, some of them (*e.g.* **Brighton, Blackpool, Scarborough**) of considerable size, exist almost solely for the purpose of providing **amusement** and recreation. They have mostly grown out of small fishing villages, though some are entirely modern and artificial.

Other towns such as **Bournemouth** and **Torquay** are not so much pleasure-towns as **health-towns.**

DIVISIONS OF ENGLAND.

185. The line of the **Oolitic Escarpment**, as already mentioned, divides England into **two** somewhat distinct physical regions: to the south and east the country is on the whole a low fertile **plain**, almost everywhere fit for agriculture; the north and west (including Wales) consists largely of barren **uplands** surrounded and separated by smaller plains.

This physical distinction between south-east and north-west is correlated with important **commercial**, **industrial**, and **political** differences, caused, however, not so much by the configuration of the country as by the absence of **coal** in the south and its presence in great abundance in the north and west.

The two regions above mentioned may be broadly described as **Metropolitan England** and **Industrial England**. For, in the former, **London** is the only **very large** centre of population.

Southern England, outside the capital, contains only **five** towns with a **population** of over 100,000. These are:—

Portsmouth,
Brighton,
Plymouth-Devonport,
Southampton,
Norwich.

Of these, **three** are sea-ports, and one (Brighton) is almost a detached suburb of London.

The rest of the population of Metropolitan England is on the whole very **evenly distributed** in villages and market-towns of no great size.

In **Industrial** England, on the other hand, there are **five** distinct regions of **very dense** population, all situated on coal-fields, and containing more than **twenty** towns with populations ranging from 100,000 up to nearly a million.

By way of contrast, there are large tracts of the **Pennine Range** and of central **Wales**, which are almost **uninhabited**.

London.

186. The pre-eminence of **London**, not only in England, but among the capitals of the world, is due to many causes.

A **fortified** post was made at London in very early days, because it was the **lowest** place where the river could be **bridged**, and so commanded both the entrance of the Thames valley and the routes from south-eastern England to the north.

As soon as the bridge was made, it marked the limit of **sea-navigation**, and hence London became a place for the loading and unloading of goods.

Until the Industrial Revolution of the eighteenth century, when steam-power changed all the conditions of manufacture, the south-eastern counties of England, grouped radially round London, were the richest and most populous part of the British Isles; and till the same time, or even later, America was commercially unimportant, so that England turned its back, as it were, upon the Atlantic, and its face towards Europe, across the Narrow Seas.

Though the absolute size and importance of London have continuously increased, and its population, with the "Outer Ring," is over seven millions, yet its importance relative to the north of England has probably rather diminished than increased during the past century.

The Lower Thames.

187. The Port of London extends for about 20 miles, from the Tower down to Tilbury, where are the deepest docks.

The port is not naturally a good one, as the entrance to the river is much impeded by sandbanks, and many lights and buoys are necessary.

The trade of the port is, however, enormous, amounting approximately to **one-third** (in value) of the entire foreign trade of the British Isles.

The **Australian** trade is specially important, and London is also the chief market in the world for **tea**, **coffee**, **cocoa**, and spices.

The **imports** of London come from all over the world; its **exports**, as might be expected from its position opposite the mouths of the Rhine and Scheldt, go chiefly to Europe. A considerable proportion of the exports are imports **transshipped**—wool, rubber, coffee, leather, and tea being the chief articles re-exported.

The other towns of the Lower Thames and the estuary are either **pleasure-towns** or are of **strategic** importance as bases for the defence of the capital. There is a great government **arsenal** at **Woolwich** (the Royal Arsenal), and there are naval dockyards and arsenals at **Sheerness** and **Chatham**. The latter, and the "twin-city" of **Rochester**, are of **historic** importance from their position on the direct road from Dover to London, the lowest route across the Medway.

The largest of the pleasure-towns is **Margate**, close to the North Foreland. **Queenborough**, on the Isle of Sheppey, sends passenger steamers daily to Flushing.

The Thames Valley.

188. The largest town of the Thames basin above London is **Reading**, situated where the river cuts a gap between the Marlborough Downs and the Chilterns, and where the Kennet joins it from the west. Reading has two flourishing industries—**biscuit-making** and **seed-growing**, and is an important **railway** junction.

Oxford is almost in the middle of the clay plain between the limestone and chalk ridges, and is a considerable market town as well as the seat of an ancient **university**.

Swindon, in the extreme west of the Thames basin, is a modern town dependent almost entirely on the **engine-works** of the Great Western Railway.

The South of England.

189. The population of the counties **south** of the Thames and the Bristol Channel is mainly concentrated on the coast-strip, in (1) **pleasure-towns**, (2) **packet-stations**

for the continent, (3) **sea-ports** and **naval ports**. The inland towns are agricultural **market** towns with many fine churches and cathedrals. **Winchester** is historically the most important of the inland towns, as it stands at the foot of the Downs on the easiest route from Southampton (where the West Saxons invaded the country) to London.

The **Weald** grows much **fruit** and **vegetables** for the vast markets of London, and contains the chief **hop-gardens** in England. Elsewhere the region is more **pastoral** than agricultural. **Sheep** are fed in large numbers on the short turf of the chalk belts, while the lower pastures are chiefly devoted to **cattle**, especially in the west.

Cheese and **cider** are among the most important products, apples being largely grown in South Devon. The almost perfectly level plain of mid-Somerset, between the Mendip and the Quantock Hills, contains some of the best grazing land in England.

190. The **packet stations** of the south coast are Dover, Folkestone, Newhaven, and Southampton, connected by daily steamers with Calais, Boulogne, Dieppe, and Havre respectively.

Dover has been from time immemorial the **natural gateway** into England from the Continent. A large **naval harbour** of refuge has been constructed there, and, apart from its great passenger traffic, the town has considerable imports of provisions and manufactured articles.

Southampton is also much more than a packet station for Havre and the Channel Islands. From its convenient position, within about two hours of London, it has become the **starting-point** of many **oceanic routes**, especially for South Africa and America. Some of the largest Atlantic liners have recently made Southampton their starting-point, instead of Liverpool.

Portsmouth is the chief station of the British **navy**, and the most strongly **fortified port** in the country. The chief bases of the British **army** lie inland, north-east and north-west of Portsmouth, at **Aldershot** and on **Salisbury Plain** respectively.

Another **naval harbour** is at Portland, and another, more important, at **Plymouth Sound**, where the "Three Towns" of **Plymouth**, Devonport, and Stonehouse are, like Portsmouth, almost wholly dependent on government expenditure. They form collectively by far the largest town of the south-west, as Portsmouth is of the south-east. The old cathedral city of **Exeter** is the only considerable town of the south-west of England, after Plymouth.

Cornwall and Devon were famous in very early times for their **tin** and **copper**. The amount of copper now raised is insignificant, but tin is still important. **Camborne** is the chief mining centre. In the south-east of Cornwall and the adjacent parts of Devon are important deposits of **kaolin** or **china-clay**, which is sent by sea to the Mersey and thence by canal to **the Potteries**.

East Anglia and the Fens.

191. This district, roughly defined by the irregular quadrilateral Lincoln-Yarmouth-Harwich-Northampton, includes the basins of the rivers flowing into the Wash, and the smaller rivers between the Wash and the Thames. It is the **largest plain** in Great Britain, no point in the whole region rising to as much as 300 feet.

Harwich, at the mouth of the Stour and Orwell, on the only good natural harbour between the Thames and the Humber, is an important **packet station** for Holland and Belgium, and a considerable commercial port. **Colchester** is the military base for the defence of London on the north-east. **Ipswich**, at the head of the Orwell estuary, is a large grain-market and agricultural centre.

The largest town of the whole region is **Norwich**, which in the days of small sailing-ships was at the head of navigation on the river Yare. It has long been the largest **grain-market** in the United Kingdom, and has in modern times developed industries connected with mustard and starch.

Yarmouth has the advantage of standing on a **roadstead** sheltered by a sandbank from easterly winds, and is the great base of the North Sea **fishing** industry. **Lowestoft** is also a fishing town and pleasure resort.

Boston and **King's Lynn** were once important ports, but the shallowness of the Wash and the increasing size of shipping have reduced them to insignificance.

The inland towns of this region are for the most part small market towns. **Cambridge**, however, is the seat of an old **university**; **Peterborough** is an important **railway** junction; and **Bedford** has small manufactures of agricultural machinery.

Northampton and **Kettering**, in the extreme west of the plain, have small local supplies of **iron ore**, and are growing **industrial** towns, chiefly engaged in making boots and shoes.

Lincoln, an old Roman town, commands the route from the Fens into the Trent valley, and stands in a gap cut by the Witham through a small limestone ridge.

The Vales of York and Trent and the Humber.

192. The line of the lower Trent, the Warwick Avon, and the lower Severn, is roughly the **boundary** between agricultural and industrial England; and the region indicated by the above heading, while still in the main an **agricultural** plain, includes several large **industrial** towns and one seaport of great importance.

The plain which includes the vales of York and the Trent does not, like the East Anglian lowland, reach the sea, except in the Humber gap. It is bounded by the Lincoln and Yorkshire Wolds (chalk), and the North York Moors (limestone). The plain is rich agricultural land, more **pastoral** than arable. The remains of Sherwood and Charnwood Forests show the original character of the country.

York is the natural centre of the northern part of the plain, as is shown by its importance in Roman times, and by its early becoming the **ecclesiastical capital** of the north of England. The many battles that have been fought near York indicate its **strategic** importance in the control of routes from north to south and from east to west.

193. Round the Humber estuary are grouped the important ports of Goole, Hull, and Grimsby, of which **Hull** is by far the largest. It owes its modern importance chiefly to its easy connections by **rail** and **water** with the large manufacturing towns of the West Riding of Yorkshire. Hull is their port for **European** trade, as Liverpool is for **American** trade. Hull is also a large fishing centre. **Grimsby** is a rapidly growing port of similar character.

The largest town on the Trent is **Nottingham**, which is on the southern extremity of the great West Yorkshire and Derbyshire coal-field. Nottingham specialises in the manufacture of **cotton hosiery** and **lace**. Further up the river, at the head of navigation, is **Burton**, which owes its position as the greatest **brewing** town in the country to the special character of its water.

Leicester, on the Soar, has a small **coal-field** close at hand, and is the chief centre of the manufacture of **woollen hosiery**; it also has a large trade in **boots** and **shoes**.

Derby, on the Derwent, is one of the principal centres of **silk** manufactures in England, and is also the **headquarters** of the Midland Railway.

The Severn Basin.

194. This consists of two convergent valleys—those of the **Severn** itself and of the **Warwick Avon**. The **Avon** valley is chiefly a pastoral well-wooded district, with the old market-towns of **Warwick**, **Stratford**, and **Evesham**. **Tewkesbury** stands at the confluence of the two rivers.

Coventry is the only large industrial town of the Avon valley, and is really a detached portion of the "Black Country." It makes **silk** ribbons, and has also become the chief English centre for the manufacture of **cycles** and **motor-cars**. **Leamington**, near Warwick, is famous for its **mineral springs**. **Rugby** is chiefly important as a **railway** junction.

There is a small **coalfield** in Shropshire on the middle Severn, and the names Coalbrookdale, Coalport, Ironbridge indicate the **industrial** character of the region.

Shrewsbury is chiefly of historical importance as one of the fortresses of the **Welsh Marches**, commanding the routes from England into Wales.

These fortresses were, from north to south:—

Chester (commanding the north coast route to Carnarvon and Anglesey),
Shrewsbury on the Severn,
Ludlow on the Teme,
Hereford on the Wye,
Gloucester on the Severn (the place of the lowest bridge on the river till modern times), and
Caerleon on the Usk (commanding the south coast route to Pembroke).

Among other small towns of the Severn valley may be mentioned **Stourbridge**, which makes stoneware from local clay; **Droitwich**, with important **brine springs**; **Kidderminster**, which makes carpets; and **Worcester**, with manufactures of porcelain and a fine cathedral.

Bristol is the largest town and **chief seaport** of the south-west of England, the Severn estuary above the mouth of the Avon being too shallow for large ships. Bristol does a large trade with Ireland in dairy and agricultural produce, and also imports much **fruit, tobacco, sugar**, and cocoa, but its exports are small.

New docks are being built at **Avonmouth**, the Avon being much too shallow for modern requirements. Two small coal-fields lie near Bristol, to the north and south of it, and supply fuel for its varied industries, which are mostly connected with food and tobacco.

The residential towns of **Bath** and **Cheltenham** stand at opposite ends of the Cotswold Hills. The former has been famous for its **mineral waters** since Roman times.

Wales.

195. Though physically a distinct region, **Wales** consists of **two** different parts—North and South Wales—with widely different activities and characteristics, and separated by a wide tract of very sparsely inhabited **uplands**. The separation of North and South Wales is emphasised by the eastward trend of the river valleys, and hence of the roads and railways.

196. North Wales subsists to a large extent on the "tourist industry," but there are very large **slate** quarries in the mountains of the Snowdon group. The slates are exported from **Carnarvon** and other small ports, and are superior in quality to any found elsewhere.

The castles of **Conway**, Carnarvon, and Beaumaris are picturesque tokens of the conquest of Wales by Edward I. Near Conway is the pleasure town of **Llandudno**, at the foot of Great Orme's Head. Lowland Anglesea and the coast plain of Carnarvon have rich pastures and many cattle. There are small **coal-fields** in Flint and Denbighshire.

On Holy Island off the coast of Anglesea is the artificial port of **Holyhead**, the chief **packet station** for Ireland.

197. The life of **South Wales** is based on the great **coal-field** which lies on the southern slopes of the mountains, and extends from near Newport to beyond Llanelly. Much of the coal is of specially valuable quality, being **anthracite** or **steam** coal, in great demand for steamers, especially war-vessels.

The chief mining town is **Merthyr Tydvil**, at the head of Taff Vale, in the extreme north of the coal-field. The commercial metropolis and chief seaport of South Wales is **Cardiff**, which exports more coal to foreign countries than any other town, though Newcastle has a larger coastwise trade in coal for domestic consumption. The new artificial harbour of **Barry Dock**, south of Cardiff, has also a large export of coal, and, though scarcely twenty years old, is already surrounded by a considerable town.

Near the other extremity of the coal-field lies **Swansea**, which is chiefly engaged in the **smelting** of metallic ores, especially of **copper**. This industry first located itself at Swansea on account of the abundance of coal and the proximity of the Devonshire copper mines; but the ores are now brought to Swansea from all parts of the world, the ships taking back cargoes of coal. The making of **tin-plate** and **zinc-plate** (*i.e.* coating sheet-iron with tin or zinc) is also an important industry in Swansea and the neighbouring towns.

Iron-smelting is a growing industry in South Wales, especially in the neighbourhood of Merthyr Tydvil, Cardiff, and Newport (Mon.). The ores are imported, chiefly from Spain.

In the extreme west of South Wales the lowland peninsula of Pembroke also has a small **coal-field**, but the chief occupation is the rearing of cattle. There is a **naval dockyard** at **Pembroke**, on Milford Haven.

The Black Country.

198. This name is given to a tract of relatively high land forming the watershed between the Severn and the Trent. **Birmingham**, the metropolis of Midland England, has long been famous for its **iron work**, but its modern development is due to the South Staffordshire **coal-field**.

Birmingham itself stands just off the coal-field, at its south-eastern corner. Its chief industries are **small metal work** of all kinds—firearms, bedsteads, bicycles, coins, buttons, watches, jewellery, etc. It is also the chief centre in England of the manufacture of brass goods. From its central position between four great ports—London, Bristol, Liverpool, and Hull—Birmingham has naturally become a great **railway centre**.

Wolverhampton, Walsall, Wednesbury, West Bromwich, and Dudley practically form one urban area continuous with Birmingham; but **Wolverhampton** makes heavier iron goods, especially railway material. Further south Bromsgrove and Redditch specialise in the manufacture of nails, needles, and fish hooks.

The Potteries.

199. This is the name given to a small district at the source of the Trent, almost equidistant between Birmingham and Manchester, and forming practically one town, called in different parts Stoke, Hanley, Burslem, Etruria, and Newcastle-under-Lyne, all engaged in the manufacture of **porcelain** and **earthenware**. The quality of the local clay gave rise to the industry here, but the clay is now mostly imported from Cornwall by water, via the Mersey and the Weaver Canal. The Potteries stand on the North Staffordshire coal-field, and ironstone is also abundant.

The Cheshire Plain.

200. This plain, which occupies nearly the whole of the county of Cheshire, is almost wholly a rural district; it possesses some of the best grazing land in the country, and is famous for its **cheese**. Its prosperity is partly due to the proximity of large **industrial** districts both to north and south of it.

Chester was once an important military station and a seaport, but the silting up of the Dee estuary has deprived it of its importance.

Crewe is an important **railway** town, created by the London and North-Western Railway Company.

There are salt mines at **Northwich, Middlewich,** and **Nantwich.** The mines are for the most part worked in this way: they are flooded with water and the brine is then pumped out.

The Lancashire Coal-field.

201. This coal-field occupies most of the southern part of Lancashire between the Mersey and the Ribble. It is one of the **most densely populated** regions in the world, and the principal seat of the **cotton** manufacture.

Manchester, which virtually forms one town with the adjoining borough of **Salford**, from which it is separated by the river Irwell, as already mentioned, has become more mercantile than industrial, the actual manufactures being carried on in the ring of large towns round it.

Oldham, **Bolton**, **Bury**, and **Rochdale** are the towns chiefly engaged in spinning, and **Blackburn**, **Preston**, **Burnley**, and **Accrington** those engaged in weaving. The demand for machinery for the spinning and weaving of cotton is so enormous that great engineering industries have sprung up at Manchester, Bolton, and Oldham.

Wigan is the centre of the Lancashire **coal** trade, while **chemicals** are largely made at **Widnes** and **St. Helens**. **Warrington** has important manufactures of wire and soap. Stockport, on the edge of the Manchester district, is a great hat manufacturing town.

The Manchester Ship Canal, about 35 miles in length, from Eastham on the Mersey, enables direct shipments of cotton to come from New Orleans to Manchester. The port of Manchester is therefore growing rapidly at the expense of Liverpool.

The centralisation of the English cotton industry in South Lancashire is due partly to the abundance of local **coal**; partly to the fact that Lancashire faces the chief source of raw cotton—the United States; and partly to the **damp atmosphere**, which is essential to the spinning of cotton. In drier climates the mills have to be "steamed."

202. Liverpool has only grown into importance in the last two hundred years, owing to the superiority of the Mersey estuary to those of the Dee and Ribble. Now, in England, Liverpool is second only to London, both in population and in the volume of its foreign trade.

Until recently Liverpool has had almost a monopoly of **passenger** traffic with America, though Glasgow and Southampton are now both competing with it in this respect.

The port of Liverpool, extending for over **six** miles along the Mersey, serves not only its immediate "**hinterland**" of Manchester and the cotton towns, but handles also nearly all the foreign trade (except European trade) of **all the industrial area** between Leeds and Birmingham. It imports vast quantities of food and raw materials.

Birkenhead, on the south side of the Mersey, is economically part of Liverpool, with which it is **joined** by ferries and a railway tunnel. The two towns together, with their nearer suburbs, have a population of over a million.

Southport, Blackpool, Morecambe, the coast towns of North Wales, and the Isle of Man are the **pleasure resorts** of Lancashire people.

Isle of Man.

203. The **Isle of Man** is an island about 10 miles wide and 30 miles long, situated in the Irish Sea, at almost equal distances from England, Ireland, Wales, and Scotland. A ridge of grassy hills, rising in **Snaefell** to over 2,000 feet, runs across the island from north-east to south-west; the north and south-east are lowland. **Fishing** and **lead mining** are the chief occupations outside the ring of **pleasure-towns** which fringes the coast. **Douglas** is by far the largest of these.

The island has a separate constitution, and is not affected by English Acts of Parliament unless specially mentioned. The Manx people are **Celtic**, and their language is akin to Erse and Gaelic.

The Yorkshire Coal-field.

204. This great **coal-field** covers an area about 20 miles wide and over 60 miles long, lying on the eastern flanks of the Pennine Range, and extending from a little north of Leeds nearly to Derby and Nottingham.

There is no one natural centre of the Yorkshire coal-field corresponding in importance and size to Manchester. **Leeds** is the commercial metropolis of the northern portion, and the centre of the **woollen** trade. Its position between the hills and the plain is very similar to that of Manchester. It is on a navigable waterway (for barges) to Hull, and has easy communications westward by rail and canal through the **Aire gap** and also by the Calder and Colne valleys. Leeds has a large **leather** industry, is the chief centre in England of the **ready-made clothing** trade, and has also considerable **iron** and **steel** works.

To the south and west of Leeds lies a cluster of towns all engaged principally in industries connected with **wool**. The largest and most important of these towns is **Bradford**, the centre of the **worsted** manufacture. **Halifax, Huddersfield, Dewsbury, Batley, Wakefield,** and other towns all specialise in some branch of the **wool** trade.

The making of looms and other **machinery** is naturally an important industry, especially in **Keighley**, on the Aire, a few miles north-west of Bradford.

205. In the southern portion of the great coal-field the chief occupation is the production of iron and steel, for which **Sheffield** has long been famous. This town is the chief centre in the world for the manufacture of **cutlery** and **tool-steel**, owing, partly at any rate, to the excellent quality of the grindstones quarried in the neighbourhood. Armour-plates and steel rails are also largely produced. The iron ore used was formerly found locally, but is now imported, chiefly from Sweden.

Rotherham, a few miles lower down the Don, shares in the industries of Sheffield, and also manufactures **brass** on a large scale.

The Northumberland and Durham Coal-field.

206. The south-east corner of Northumberland and the greater part of the county of Durham form another great **coal-field**. This is very favourably situated for the export of coal, having a long sea-front with numerous ports. London gets most of its coal by sea from this coal-field.

The Tyne ports (**Newcastle-Gateshead, Jarrow, North** and **South Shields**, and **Tynemouth**) collectively rank fourth among the seaports of the United Kingdom in tonnage of ships, being exceeded only by London, Liverpool, and Cardiff. **Sunderland** on the Wear, and the **Hartlepools** at the mouth of the Tees are the other ports of the coal-field.

Immediately to the south of the coal-field, in the Cleveland Hills, lie the greatest deposits of **ironstone** in England, the smelting of which has given rise to the entirely modern town of **Middlesbrough**. It is said that the essential

materials for iron manufacture—ore, coal or coke, and limestone—can be brought together at Middlesbrough more cheaply than anywhere else in the world, all being found in abundance within a few miles of the town.

The Tyne and Tees ports, with Sunderland, are the chief seats of **shipbuilding** in England, and second only to the Clyde in the world.

Salt is abundant in the low ground on both sides of the lower Tees, and has given rise to numerous **chemical** works, salt being the chief raw material for the manufacture of "alkali."

Newcastle, as the lowest bridge-town on the Tyne, and the old cathedral city of **Durham**, on a crag overlooking the Wear, were of strategic importance in the days when Scotland was a separate and often hostile country.

The Lake District.

207. The **Lake District** is an oval-shaped tract of high land, its axis running east by north from Scafell, the highest peak. It is nearly separated from the Pennines by the valleys of the Eden and Lune, between which lies the connecting ridge of Shap Fell.

The lakes lie in deep rock-basins radiating from the central axis. To the north the chief lakes are **Ullswater**, draining to the Eden, **Thirlmere**, which supplies Manchester with water, and **Derwentwater** and **Bassenthwaite**, flowing by the Derwent into the Irish Sea. To the south are **Windermere**, the largest lake, and **Coniston**, both draining into Morecambe Bay.

On the seaward margin of the Lake District are two small industrial areas. (1) On the north-west is a small **coal-field** with some iron, and the ports of **Whitehaven**, Workington, and Maryport, all in Cumberland. (2) On the south-west, in the Furness district of Lancashire, are rich deposits of very pure **haematite iron** ore, which has given rise to the **metal** and **shipbuilding** industries of **Barrow-in-Furness**, another entirely modern town, like Middlesbrough.

The Lake District proper is primarily a **tourist resort**. There are only two small towns—**Ambleside**, at the head of Windermere, and **Keswick**, on Derwentwater. The manufacture of **pencils** persists on a small scale at Keswick, though the plumbago mines of Borrowdale, which gave rise to the industry, have long been exhausted, plumbago being now imported from Ceylon.

The Borderland.

208. North of the Tyne gap is a hilly pastoral region, rising in the **Cheviots** to over 2,000 feet, and flanked by fertile **lowlands** west and east—the valleys of the Eden and Tweed and the coastal plain of Northumberland, some ten miles wide. The country is sparsely inhabited and has no large towns. It is, however, of great historical interest, and has seen much fighting.

Carlisle and **Berwick**, at opposite ends of the Border, are the two gateways from Scotland into England. The former is now a very important **railway** junction. Three main Scotch lines converge on it from the north, and two main lines run southward to London, while there are branch lines to Newcastle, Whitehaven, and Stanraer (for Belfast).

The east coast lowland has many **castles**, which show its military importance in earlier times, a fact illustrated also by the **battlefields** of Otterburn, Halidon Hill, Flodden, and Hexham.

The latter town was of peculiar importance as a connecting link between Newcastle and Carlisle, commanding also the least difficult route across the Cheviots, via the North Tyne. **Hadrian's Wall** runs from Newcastle to Carlisle a little north of the Tyne.

ENGLISH RAILWAYS.

209. The **Great Eastern** Railway (Fig. 53) has a monopoly of the railway traffic of East Anglia between London (Liverpool Street) and the Wash. Its main lines run (1) north-eastward parallel to the coast through Chelmsford, Colchester, and **Ipswich** to Lowestoft, **Yarmouth**, and through Stowmarket to **Norwich**; (2) nearly due north to **Cambridge** and Ely, then east to Norwich and Yarmouth, or north to Lynn and the coast. The former of these lines sends off a branch from Manningtree to Harwich, whence steamers run to Antwerp, Rotterdam, and the Hook of Holland.

A branch line from Ely, through March to Peterborough, connects the Great Eastern system with that of the Great Northern.

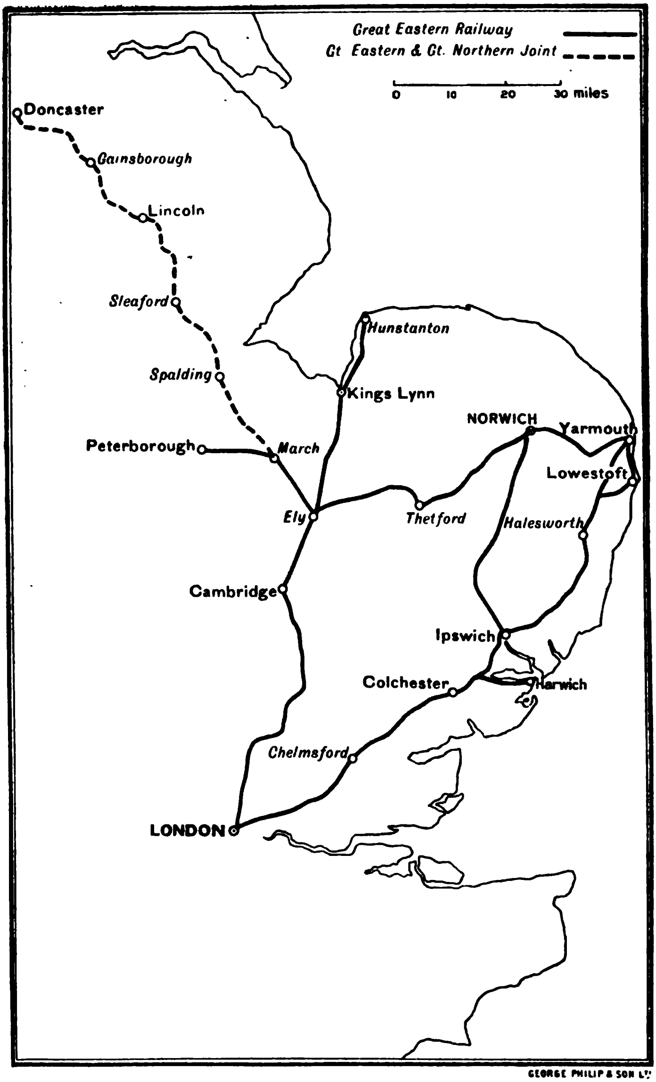

Fig. 53.—Great Eastern Railway.

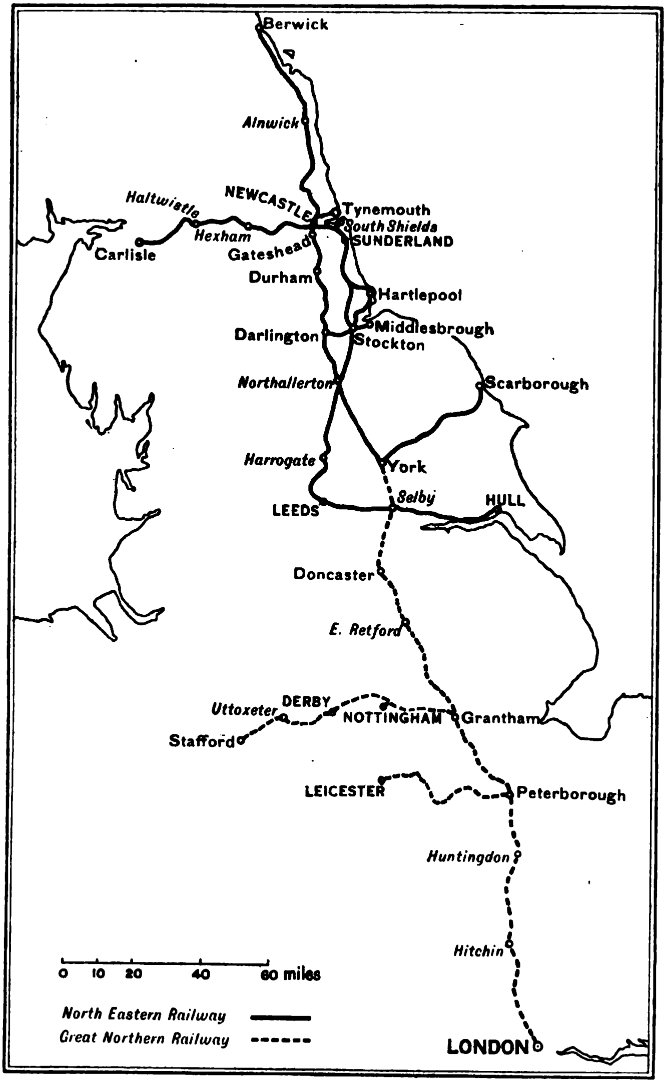

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Fig. 54.—Great Northern and North Eastern Railways.

What is known as the Great Northern and Great Eastern Joint Railway runs north from London through Cambridge, Ely, and March to **Lincoln**, Gainsborough, Doncaster, and York.

210. The **Great Northern** (Fig. 54) is one of the main arteries of traffic between London and the north. It runs from King's Cross through Huntingdon, **Peterborough**, Grantham, Newark, and **Doncaster** to **York**, where it joins the North-Eastern.

A branch line from Peterborough connects the Great Northern with the Midland Railway at **Leicester**. Other important branches run from Grantham to Stafford, via Nottingham and Derby.

211. The **North-Eastern** (Fig. 54) serves the district included in a triangle having its apex at Berwick and its other extremities at Leeds and Hull. The main line, which may be considered a continuation of the Great Northern, begins at **York**, and runs northward through Thirsk and **Northallerton**. It crosses the Tees and then passes **Darlington** and **Durham**. Before entering **Newcastle** the line crosses the Tyne by the High Level Bridge. From Newcastle it proceeds, passing close to the coast, through Morpeth to **Berwick**, where it joins the North British Railway.

There are numerous branch lines in East Yorkshire and Durham, by which **Scarborough**, **Middlesbrough**, and **Sunderland** are connected with York on one side and the Tyne ports on the other. A branch also runs from **Newcastle** to **Carlisle** through the Tyne gap.

The Great Northern and Great Eastern combine with the North British Railway in Scotland, to form what is called the **East Coast Route** to Scotland. This route had to encounter fewer natural obstacles than any other main line to the north or west of London. It is nowhere so much as 500 feet high, there are no steep gradients, and no long tunnels.

212. The **Midland** (Fig. 55) main line joins London (St. Pancras) with **Carlisle**. It runs through a gap in the chalk escarpment cut by the river Lea at Luton, and at **Kettering** divides into two branches, one of which cuts through the jurassic escarpment near **Market Harborough**, and then descends into the Soar Valley at **Leicester**. From Leicester this line proceeds to **Trent** Junction, whence it sends out a branch to **Derby**.

The second branch from **Kettering** passes through **Oakham** and **Melton Mowbray** to **Nottingham** and joins the main line again at **Trent**.

From Trent the main line skirts the east side of the Pennine Range and passes through **Chesterfield**, **Sheffield**, and **Leeds**. Thence it runs up the Aire valley into the valley of the Ribble, which it ascends to the head (Ribblehead Station, 1,000 feet above sea level). A high pass beyond this, with a long tunnel, leads to the Eden valley and **Carlisle**, where the Midland connects with the Scottish lines.

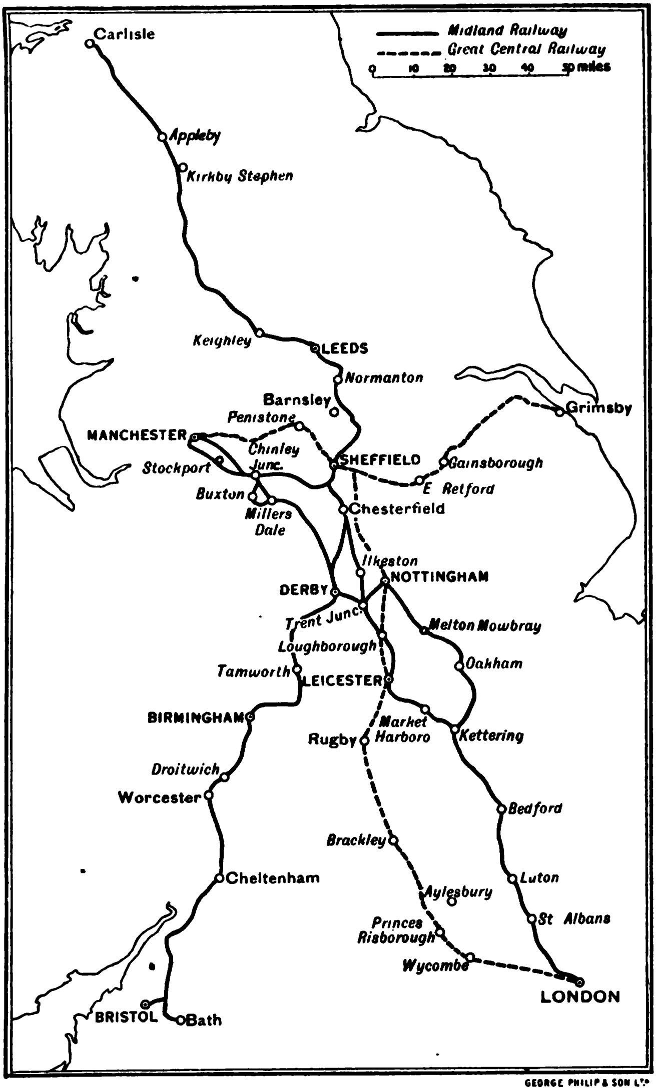

Fig. 55.—Midland and Great Central Railways.

From **Trent** the Midland has another line which runs through **Derby** to **Buxton** and **Manchester**, passing south of the Peak. A cross line from **Chinley**, with several long tunnels, connects this line with **Sheffield.**

The western main line of the Midland Railway connects the north-east with the west and south-west, and runs from **Derby** through **Burton-on-Trent, Birmingham, Cheltenham,** and **Gloucester** to **Bristol** and **Bath.**

213. The **Great Central** (Fig. 55) is a comparatively new system, based on the line Manchester-Sheffield-Grimsby, but with an extension to London (Marylebone). It crosses the Pennine ridge a few miles north of the Peak in a **tunnel three miles** long, but from Sheffield eastward the line is very level.

The new southward extension follows nearly the same route as the Midland main line from Sheffield to Leicester, and then proceeds by **Rugby** and **Brackley.** It crosses the Chiltern Hills by the **Wendover gap** just south of Aylesbury, and also by the Wycombe gap further west.

214. The **London and North-Western** (Fig. 56) is important both for Scotch and Irish traffic, as its main lines run both to **Carlisle** and **Holyhead.** After leaving London (Euston) the line crosses the Chilterns in a dry gap at **Berkhampsted,** and the jurassic escarpment near **Rugby.** From Rugby branch lines run to Coventry, **Birmingham,** and the Black Country, but the main line runs through **Stafford** and the Potteries to **Crewe.**

From Crewe one line runs through **Chester** and along the North Wales coast to **Holyhead,** and another runs northward through **Warrington, Wigan,** and **Preston** to **Lancaster.** North of this the line rises to Shap Fell (1,000 feet) and descends through **Penrith** to Carlisle, to meet the Scotch lines.

Branches run from Crewe to **Manchester** and **Leeds,** and from **Warrington** to **Liverpool.** Another very important line runs from **Crewe** by Nantwich to **Shrewsbury** and thence through hilly country to Ludlow and **Hereford,** sending out another branch from Craven Arms to **Swansea,** thus bringing South Wales into connection with the Midlands and north-west of England.

215. South Lancashire and West Yorkshire are also joined by an important branch of the L. and N.W.R. from **Leeds via Huddersfield** to Manchester, crossing the Pennines in the Standedge Tunnel, three miles long.

216. The **Great Western** (Fig. 57) system is more widely extended than any other in the British Isles, as it covers roughly the triangle formed by London (Paddington), Chester, and Land's End.

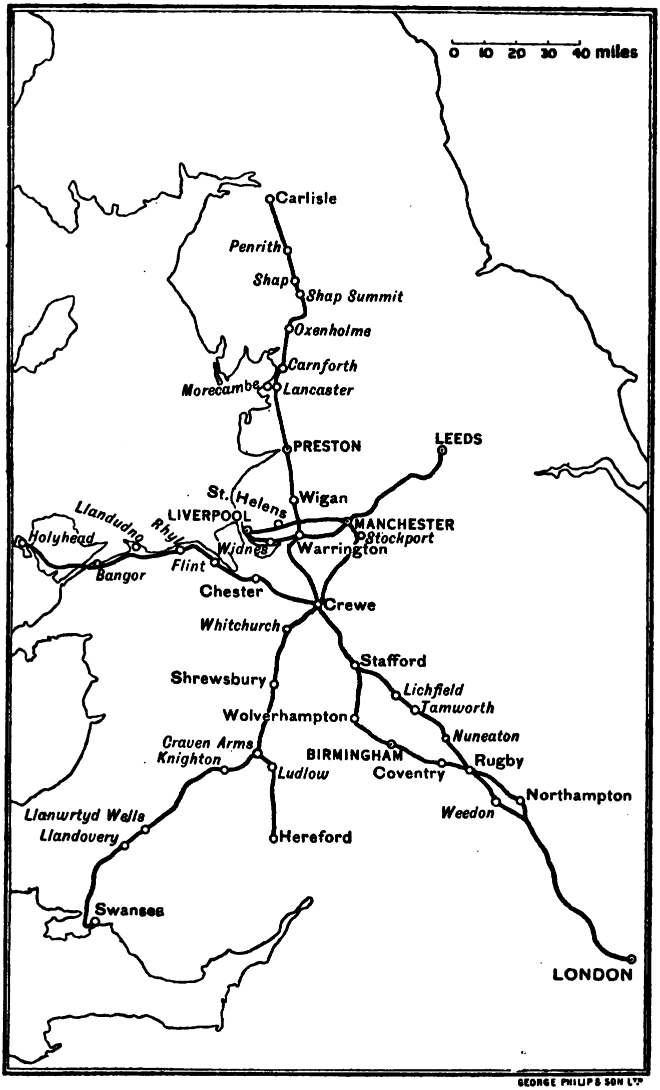

Fig. 56.—London and North Western Railway.

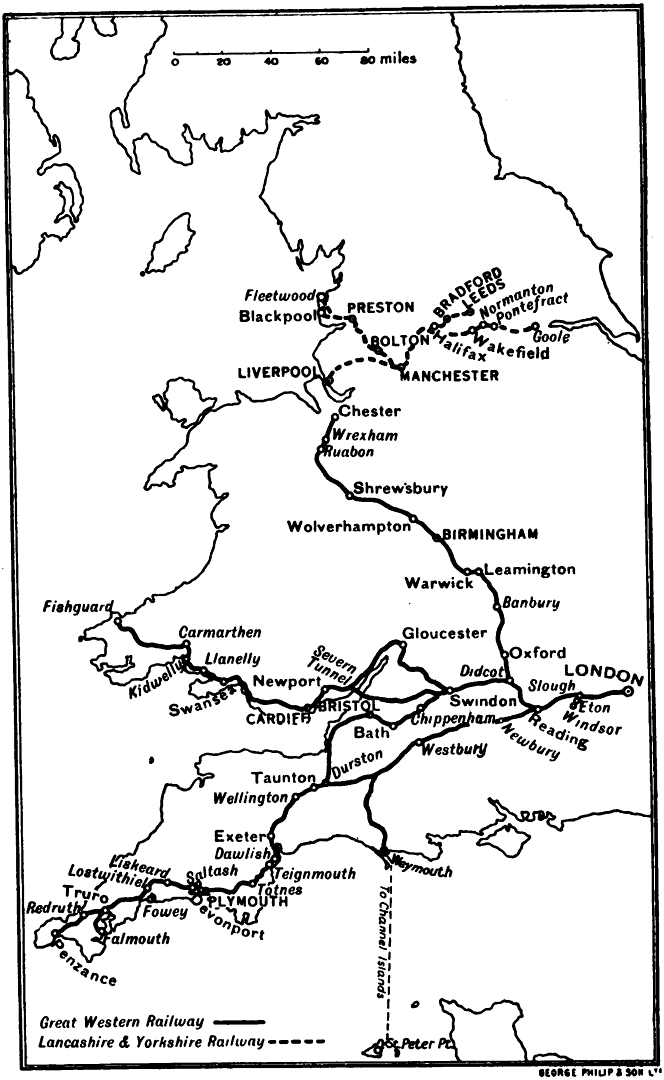

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Fig. 57.—Great Western and Lancashire & Yorkshire Railways.

The main western line goes through **Reading** up the Kennet valley and through the Vale of Pewsey, between the Marlborough Downs and the North Wiltshire Downs, to **Taunton** and **Exeter,** with an important branch through Yeovil to Weymouth, whence steamers run to the Channel Islands. It then skirts the south of Dartmoor to **Plymouth** and passes along the south of Cornwall to **Penzance.**

From Reading the older main line of the system runs through **Swindon** to **Bath, Bristol,** and **Taunton,** crossing the Cotswolds in the **Box Tunnel.**

From Swindon another line runs nearly due west through the **Severn Tunnel** to Newport, **Cardiff, Swansea,** and **Fishguard,** a port for Irish trade, the steamers running to Rosslare. Branch lines connect **Newport, Cardiff,** and **Swansea** with Merthyr Tydvil and the other towns of the South Wales coal-field.

The northern line of the Great Western runs from **Reading** up the Cherwell valley to **Oxford,** and thence to **Birmingham, Shrewsbury,** and **Chester.**

217. The **Lancashire and Yorkshire** Railway (Fig. 57) is the only important system in England which has no direct connexion with London. Its headquarters are at Manchester, and its main line runs from **Goole** through **Wakefield, Rochdale,** and **Manchester** to **Liverpool,** thus connecting the busy industrial districts on both sides of the Pennines by means of the Calder valley.

There are numerous branches on both sides of the hills, especially in Lancashire. The principal tunnels occur between Todmorden and Rochdale.

218. The **London and South-Western** (Fig. 58) is a much smaller system joining London (Waterloo) to **Plymouth** by way of **Basingstoke, Salisbury, Exeter,** and the north of Dartmoor. The line crosses the chalk uplands of Wiltshire and north Hampshire almost without deviation, and hence has steeper gradients than the Great Western line a few miles north of it.

An important branch diverges at Basingstoke and runs southward through the Winchester gap to **Southampton,** whence branches run to **Bournemouth** and **Weymouth.** There is a service of steamers from Southampton to the **Channel Islands.**

Another important branch diverges from the main line at Woking and runs through the Wey gap at **Guildford** to **Petersfield, Havant, Portsmouth.**

219. The **London, Brighton, and South Coast** Railway (Fig. 59) covers a triangle formed by London (Victoria and London Bridge), **Portsmouth,** and **Hastings, Brighton** being in the centre of the base.

Different branches make use of the Wey gap at **Guildford,** the Boxhill tunnel at **Dorking,** and the Merstham tunnel north of **Redhill**; and of the Arun, Adur, and Ouse gaps in the South Downs.

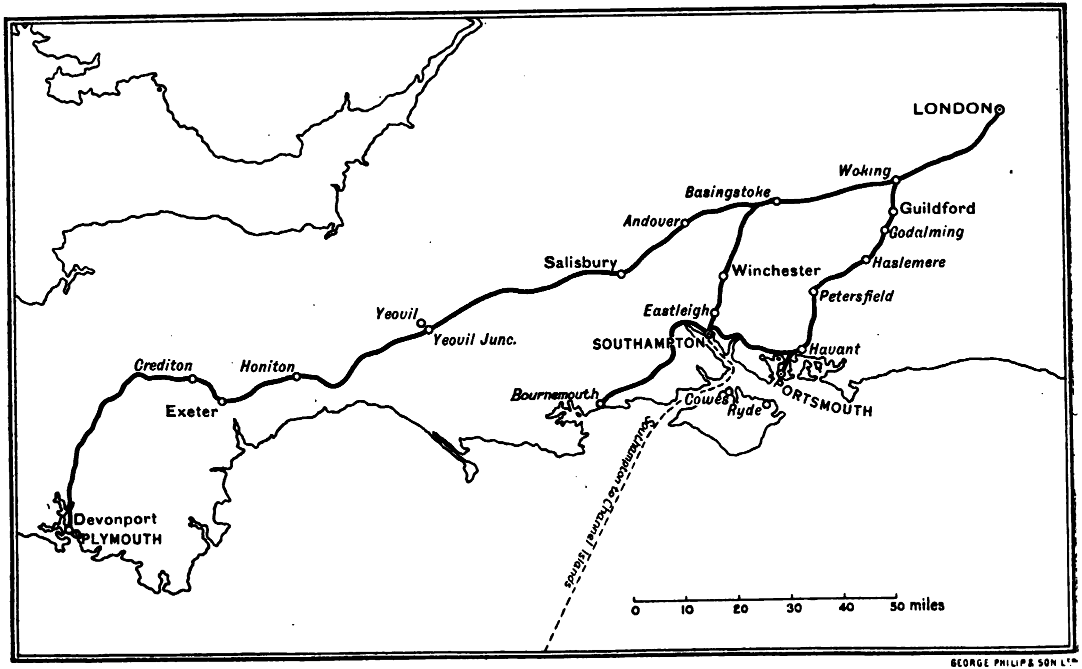

Fig. 58.—London and South Western Railway.

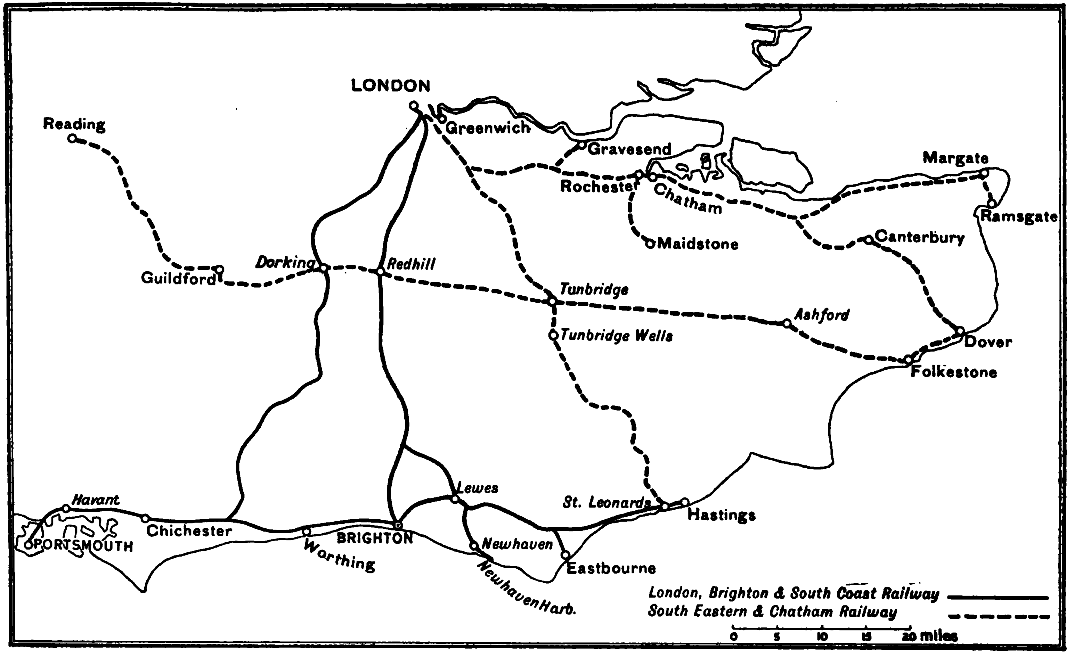

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Fig. 59 —South Eastern and London, Brighton, and South Coast Railways.

The direct line to Brighton, however, cuts through the South Downs in a tunnel. Lines run east and west along the coast and also through the middle of the Weald.

220. The **South-Eastern and Chatham** Railway (Fig. 59) has two lines from London to Dover: (1) from Holborn and Victoria through **Rochester** and **Chatham,** skirting the north edge of the North Downs nearly all the way, to Faversham (whence a branch runs to Margate and Ramsgate) and then on through **Canterbury** to **Dover**; (2) from Charing Cross through the North Downs to Sevenoaks, then across the Weald to **Tunbridge**, Ashford, and **Folkestone.** The latter line is joined at Tunbridge by a line which connects with the Great Western at Reading and passes through Redhill and Guildford. From Tunbridge a line runs to Hastings. This company has also a North Kent line to Maidstone.

CHAPTER IX.

SCOTLAND.

I. THE SOUTHERN UPLANDS.

221. The **Southern Uplands** extend across the south of Scotland from sea to sea, from south-west to north-east, in conformity with the general "grain" of the country. In the south the **Cheviot Hills** form for about forty miles the border between England and Scotland. The Cheviots are separated by the broad valley of the Teviot-Tweed from the **Lammermoor** and **Moorfoot** Hills. The two latter ranges are parted by a narrow gap through which Gala Water flows to join the Tweed.

Just south of Edinburgh lie the most northern of the Southern Uplands, the **Pentland Hills**, separated from the Moorfoot Hills by the two branches of the Esk.

The core of the Southern Uplands is an irregular group of hills between the headwaters of the Tweed, Teviot, Annan, and Clyde, sending numerous streams to all four rivers. The chief heights are **Broad Law** and **Hart Fell**, both about 2,700 feet high.

Further west the general level of the country gradually descends, though isolated hills rise to over 2,000 feet. The chief valleys of the western portion—the Annan, Nith, and Dee opening southward, and the Clyde northward—are all transverse.

222. The country is almost treeless except in the valleys. The grassy hills form the greatest sheep-run in the British Isles. As usual in sheep-rearing districts, the population is scanty and there are no large towns. **Galashiels, Hawick**, and **Selkirk** in the east, and **Dumfries** in the west, are the principal centres of the "**Tweed**" cloth manufacture.

In the lowland strip along the north shore of the Solway Firth, and in Wigtownshire, **cattle** and not sheep are the chief source of wealth. The two small ports of **Stranraer** and **Portpatrick** afford the shortest sea-passages to Ireland, sending steamers respectively to Larne and Donaghadee.

The coastal plain of Ayrshire is a lowland about 10 miles wide and 20 long, almost completely surrounded by hills, which reach the coast both north and south of it. Its northern portion, between the two small ports of **Troon** and **Ardrossan**, contains a considerable coal-field. Ironstone is also found, and smelted chiefly at **Kilmarnock**, which manufactures railway material.

Railways of Southern Scotland.

223. In Scotland, much more than in England, the routes followed by the railways are instructive commentaries on the configuration of the country, as the difficulties of construction have been greater. This is more especially the case with the Highland railways (*q.v.*). **Three main** lines of railway traverse the Southern Uplands, all diverging from Carlisle,

(1) The main line of the **North British** Railway runs from Carlisle up the valley of the Liddel and across a spur of the Cheviots at a height of 1,000 feet, descending to **Hawick** in Teviotdale and **Galashiels** on the Tweed, whence it goes north, through the Gala gap already mentioned, to Edinburgh. For the other North British main line see East Coast route, p. 166.

(2) The **Caledonian** Railway runs from Carlisle up Annandale, and across a ridge 1,000 feet high, between the Lead Hills and Hart Fell, into Clydesdale, diverging at **Carstairs** into two branches, running to Glasgow and Edinburgh respectively.

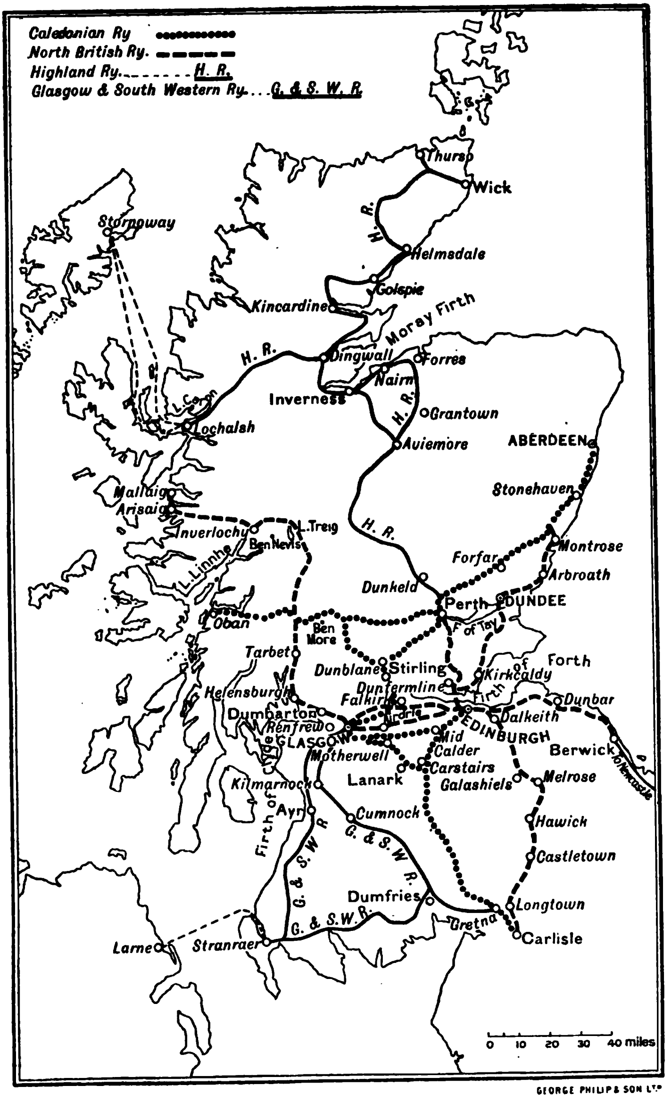

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Fig. 60.—Scottish Railways.

(3) The **Glasgow and South-Western** Railway runs from Carlisle up Nithsdale past Gretna and **Dumfries** nearly to the source of the river, descends across the Ayr valley into the Irvine valley at **Kilmarnock**, and thence runs northward to Glasgow through a low gap in the hills of south Renfrewshire. This line, though more circuitous than the other two, follows a much less difficult route, as its summit level, near Cumnock, is only about 600 feet.

(4) The **East Coast Route** (North British) from **Berwick** is throughout a lowland route. It is mostly close to the sea, except where it runs a few miles inland through a low pass between St. Abbs Head and the Lammermoor Hills. The battle-fields of Dunbar and Prestonpans indicate the former importance of the coast road to Edinburgh.

II. THE CENTRAL LOWLANDS.

224. Central Scotland consists of a **rift valley** about 50 miles wide, lying south-west by north-east between the Highland edge on the north and the Pentland Hills and Lanark Moors on the south. Along the central line of the lowlands rise like islands the isolated ranges of the **Campsie Fells**, the **Ochil Hills**, and the **Sidlaw Hills**.

The Lowlands proper consist of the basins of (1) the lower Clyde, (2) the Forth, (3) the lower Tay. The last-named basin consists of two parts—**Strathmore** on the north of the Sidlaw Hills and the **Carse of Gowrie** on the south.

The lowland valleys are very fertile, are among the best cultivated parts of the British Isles, and grow heavy crops. The presence of a large **coal-field** stretching from the Clyde to the Forth, and the penetration of the land by three large **navigable estuaries**, have resulted in the concentration of much more than half of the population of Scotland in the small area of the Central Lowlands. Nearly all the industries of the country, and all the large towns with one exception (Aberdeen), are contained in this area.

Glasgow and the Clyde.

225. The lower Clyde is one of the busiest seats of industry in the world, and **Glasgow** is the largest British town after London. It has centralised Scotch industry and commerce to such an extent that with its immediate suburbs it contains about **one-fifth** of the whole population of the country.

A town naturally arose at Glasgow in early days owing to the intersection of routes (1) north and south from Clydesdale to Dumbarton and Loch Lomond, (2) east and west from Edinburgh across the Clyde into the Ayrshire plain. The modern growth of the town is due (1) to the presence of **coal** and **iron** in the immediate neighbourhood, and (2) to the artificial deepening of the Clyde, which has made Glasgow a large seaport, actively competing with Liverpool.

In the Clyde basin as a whole the most important industries are **shipbuilding** and **marine engineering**. These are prosecuted on both sides of the river below Glasgow, **Dumbarton**, **Port Glasgow**, and **Greenock** being specially famous for shipbuilding.

Though ironstone is found in the coal-field further inland, the district is becoming more and more dependent on imported ores, as are all British iron centres. The chief iron-smelting towns are **Hamilton**, **Airdrie**, **Coatbridge**, and **Falkirk** (the last in the Forth basin).

After South Lancashire, Glasgow is the chief centre of **cotton** manufacture in the British Isles, the materials chiefly made being fine lawns and muslins. **Paisley** specialises in cotton thread.

The outlets of the Clyde industries for foreign trade are, on the west, Glasgow itself and the other Clyde ports, and, on the east, **Grangemouth**, on the Forth, reached by canal and rail through Falkirk.

The **Firth of Clyde** contains the picturesque islands of **Bute**, **Arran**, and the Cumbraes, which together form a separate county. Bute is low, but in Arran, the largest island, Goat Fell rises nearly to 3,000 feet. The **Crinan Canal**, across a depression at the base of the Kintyre peninsula, provides a short sea-route from the Clyde to **Oban** and the Western Highlands.

Loch Lomond (45 sq.m.), the largest lake in Great Britain, is joined to the Clyde by the short river Leven at Dumbarton. The northern part of Loch Lomond is a typical mountain lake, long, narrow, and deep, with mountains rising steeply to over 3,000 feet. The southern and wider portion, with numerous islands, belongs to the lowlands. All the other lakes in Scotland, except Loch Leven in Fife, are highland lakes.

Edinburgh and the Forth.

226. The **Forth** rises near Ben Lomond, and flows E.S.E along the north side of Campsie Fells. It is distinctively a lowland river, differing markedly in this respect from the Clyde, which only reaches the lowland near Lanark in a series of fine waterfalls.

The first important town on the Forth is **Stirling**, which grew up round a crag of igneous rock standing midway in the gap between Campsie Fells and the Ochil Hills at what was till recently the lowest bridge on the river. It commanded routes (1) west to Dumbarton by the Forth, (2) north-west by the Teith to Callander and the upper Tay, (3) north-east by Allan Water to Perth. Thus the castle and bridge of Stirling were of enormous military importance for the control of the Highlands. **Bannockburn** was fought about two miles south of Stirling.

227. Edinburgh, like Stirling, grew up round a castle rock. It stands halfway between the Pentland Hills and the shore of the Firth of Forth, commanding routes westward to Glasgow, southward through the Gala gap to Tweeddale, eastward to Dunbar and Berwick, and north-westward through Stirling to the Highlands.

Edinburgh is the political and legal **capital** of Scotland, and is financially important as the headquarters of many insurance companies. It has large **printing**, **brewing**, and **distilling** works, and many of the surrounding villages manufacture **paper**. The port of **Leith**, about three miles away, has a large import trade, but few exports, as Edinburgh is not a great manufacturing centre. There is a small **coal-field** round **Dalkeith** in the Esk valley, a few miles south-east of the capital.

The peninsula of **Fife**, between the Firths of Forth and Tay, is of more historical than modern importance. There is another small coalfield in the south, round **Burntisland** and **Kirkcaldy**. The latter has large linoleum works. **Dunfermline** is noted for its manufacture of table-linen. The old university town of **St. Andrews**, the Mecca of golfers, is on the east coast.

Bituminous **shale** is found in large quantities in Linlithgow and Midlothian and across the river in western Fife. Paraffin is distilled from the shale and made chiefly into candles.

Strathmore.

228. Strathmore is the fertile agricultural valley between the Grampian edge on the north-west and the Sidlaw Hills on the south-east. Its only important town is **Perth**, which was until recently the lowest bridge-town on the Tay, and occupies a strategic position comparable in importance with that of Stirling.

Roads and railways diverge from Perth in all directions—north-west to the **Central Highlands** by Glen Garry; west to Loch Earn; south-west to **Stirling** by Allan Water; south to **Edinburgh**, across the Ochils by the Pass of Glenfarg; east to **Dundee** by the Carse of Gowrie; and north-east through Strathmore to Forfar and **Aberdeen.**

Perth also is one of the chief seats in the United Kingdom of dyeing and bleaching—an industry usually carried on in small towns, as pure water and pure air are necessary to its success.

Carse of Gowrie.

229. This fertile and well cultivated plain is the smaller lowland between the Sidlaw Hills and the Firth of Tay.

Dundee, the fourth largest town in Scotland, stands at its eastern end. It is the only British port which still sends out a fleet of **whaling ships**. The staple occupation of Dundee, however, is the manufacture of **jute**, the raw material being imported from India. There are also large **jam** factories, partly supplied with fruit grown locally.

Railways of Central Scotland.

230. The routes from the south to Edinburgh and Glasgow have been already described. Between those two capitals there are three main lines of railway:—

(1) The **North British** has two of these. One of them runs nearly due west to **Falkirk**, and over the low watershed (200 feet) between the River Carron, which joins the Forth at Grangemouth, and the River Kelvin, which joins the Clyde at Glasgow. This route is also followed from Grangemouth to Glasgow by the Forth and Clyde Canal.

The other line runs through **Bathgate**, **Airdrie**, and **Coatbridge**, to Glasgow, thus tapping the great manufacturing district.

(2) The **Caledonian** line between the two capitals follows a somewhat more difficult hilly route a few miles further south, and passing through Holytown sends out branches to the iron towns of the central coal-field. The valley of the Clyde-Forth is in fact one great network of railways.

The **Caledonian** main line to the north from Glasgow makes a wide circuit round the east of Campsie Fells to Stirling, and thence runs up Allan Water, down the Earn valley to **Perth**, and up Strathmore to **Forfar**. It then crosses the Esk; and, sending out a branch line to **Montrose**, passes through Stonehaven to **Aberdeen.**

The **North British** main line from Edinburgh crosses the Forth by a great bridge about six miles above the town, and separates into two branches, one line running due north through Glenfarg to **Perth**, while the other runs via **Kirkcaldy** and Cupar, and across the Tay Bridge to **Dundee**. From Dundee the line follows the coast very closely to **Montrose**, where it joins a branch of the Caledonian line to Aberdeen.

There are numerous branch lines connecting **Aberdeen** with other coast towns.

III. THE NORTH-EAST COAST PLAIN.

231. From the mouth of the Tay northwards there is along the coast a **lowland strip** generally about ten miles wide. Between Montrose and Stonehaven the mountains approach the sea more closely, and the plain is narrower. Further north it widens out again, to include the triangular area between Aberdeen, Peterhead, and Banff.

From Banff westward a narrower plain extends to Inverness and round the heads of the Firths of Moray, Cromarty, and Dornoch. In the extreme north-east is another flat triangular area bounded by Wick, Thurso, and Duncansby Head.

Aberdeen, the third city of Scotland, stands between the mouths of the Don and Dee, on the coast road northwards, and is thus a natural distributing centre for a large area.

Aberdeen is famous for its quarries of grey granite, and since the Forth and Tay Bridges have given it more rapid connection with the south, it has become an important fishing port, while it also has a large trade in cattle. The plain from Aberdeen to **Banff** is well cultivated, and is the only part of northern Scotland with a fairly dense population.

Wick and **Thurso** in Caithness are small fishing ports, with steamer connections with the Orkney and Shetland Isles.

IV. THE HIGHLANDS AND ISLANDS.

232. The Highlands are "the product of a deeply incised system of valleys impressed upon an **ancient plateau**, the recent depression of which on the west has formed the islands." (Mill, *International Geography*.)

As in the rest of Scotland, the main surface features of the Highlands and islands lie along lines approximately south-west by north-east. Note, for example, the Outer Hebrides, the Minch (a submerged rift valley), the Sound of Sleat, Loch Shiel, Loch Linnhe and **Glenmore**, Loch Awe, Loch Fyne, the Sound of Jura, Loch Tay, Loch Ericht, and the valleys of the Nairn, Findhorn, and Spey.

There are also, however, a number of **transverse** lines at right angles to the main longitudinal features. Thus in the north we have the River Helmsdale, Loch Shin and Loch Maree; and further south the Sound of Mull, the Crinan Canal, Loch Lomond, and the valleys of the Teith and the Garry-Tay.

233. On account of their high average elevation, wet climate, poor soil, and difficulties of communication, the Highlands are economically a very poor region—so poor that the large counties of Sutherland, Ross and Cromarty, and Inverness, with a total area almost exactly one-third of the whole country, contain only about one-twenty-fourth of the population, very little more than the city of Aberdeen.

Sheep-rearing, the preservation of **game**, **fishing**, whisky distilling, and the "tourist industry" are almost the only occupations, and except in a few tourist centres the population is decreasing.

234. The **North-Western Highlands** are those lying to the north-west of Glenmore and Loch Linnhe. They are of less average elevation than the Grampian Highlands on the south-east. The rivers are little more than mountain torrents, but there are many beautiful lakes, of which the chief are Lochs **Shin**, **Maree**, Morar (the deepest lake in the British Isles), and **Shiel**.

Only two railways cross the North-Western Highlands. One, a branch of the **North British** Railway, runs from Fort William alongside Loch Eil and round the end of Loch Morar to **Mallaig** on the Sound of Sleat. The other, a branch of the Highland Railway, runs from **Dingwall**, through Strathpeffer, up Strath* Bran and down Strath Carron to the Kyle of Lochalsh, whence steamers leave for **Portree** and **Stornoway** (§ 235).

The only railway north of Dingwall is the Highland line to **Caithness**. It follows a very circuitous route round the head of Dornoch Firth and then along the coast to Helmsdale, where it is diverted far inland by the mountains of Morven, and so approaches **Wick** and **Thurso** from the west instead of from the south.

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* Strath = valley.

The Hebrides.

235. The **Inner Hebrides** consist of the Isles of **Skye**, Rum, Coll, Tiree, **Mull**, Jura, Islay, and many smaller ones. Mull, Skye, and Rum, together with the Ardnamurchan peninsula, were covered in geologically recent times with a succession of lava sheets, and their mountains are the denuded stumps of old volcanoes. **Fingal's Cave**, in the small island of **Staffa**, off Mull, is famous for its columns of basalt, produced by the crystallisation of cooling lava.

The Outer Hebrides consist of the large island of **Lewis and Harris**, and the smaller ones of North and South Uist. Though composed of hard igneous rock, like the Highlands, their surface has been so much denuded that, except in Harris, they now consist of low plains, cliff-bound. **Portree** in Skye, and **Stornoway** in Lewis, the only towns of the Hebrides, are fishing ports and tourist centres.

The Northern Islands.

236. The **Orkney Isles** are similar in character to the sandstone plain of Caithness, from which they are separated by the rough waters of Pentland Firth. **Kirkwall** and **Stromness**, on **Pomona** or Mainland, are the only towns. The inhabitants are fishermen or shepherds.

The **Shetland Isles**, fifty miles further north, are composed of igneous rocks like the Highlands. **Lerwick**, on Mainland, is a small port and fishing centre. The Shetlands are noted for fine wool, and for a breed of small hardy ponies.

In the Orkney and Shetland Isles, as well as in Caithness, the people are of Scandinavian origin, descendants of the Norsemen, and differ markedly from the Highlanders, who are Celts.

Glenmore and the South-Eastern Highlands.

237. **Glenmore**, or the Great Glen, has been already mentioned (§ 147). The **Caledonian Canal** is of no modern importance except as a tourist route. **Inverness**, standing on the lowland at its northern end, has always been the capital of the Highlands, from its control of different routes. It is an important sheep-market.

The names of **Fort George**, at Inverness, **Fort Augustus**, at the south end of Loch Ness, and **Fort William**, at the head of Loch Linnhe, recall the military importance of Glenmore in the days of Jacobite risings. Culloden Moor, where the Stuart cause was finally lost, is about five miles east of Inverness. The **Falls of Foyers**, on a small river flowing north into Loch Ness, are used to produce electric power for aluminium works.

238. The South-Eastern Highlands form a great mass of high ground, large areas of which are over 2,000 feet high, while the peaks vary from 3,000 to 4,400 feet. The lower slopes grow coarse grass and heather; most of the higher summits are bare rock. The centres of population—hunting, fishing, or tourist resorts, such as Ballater and Braemar on the Dee, Blair Atholl on the Garry, and Callander on the Teith—are little more than large villages.

Highland Routes and Railways.

239. The chief north and south route of the Highlands is from **Perth** up the Tay and Garry glens, through the gorge of **Killiecrankie**, and over Drumochter Pass into upper Glen Spey. The railway from Glen Spey to Inverness formerly made a long détour through Grantown and **Forres**, but a more direct line has been made through very difficult country. It diverges from the older line at **Aviemore** and runs across the upper Findhorn and Strath Nairn to Inverness. This is now the main line of the **Highland** Railway.

The only other north and south railway is the **North British** line from Glasgow, which runs between Loch Long and Loch Lomond, close to the former, through the gap between Ben More and Ben Lui, and across the high Rannoch Moor, making a wide détour round Ben Nevis, and descending Glen Spean to **Fort William.** The continuation to **Mallaig** has been already described (§ 234).

The principal east and west route of the Highlands is a branch of the **Caledonian** Railway—or rather, two branches, from Perth and from Dunblane, uniting at the head of Loch Earn, and thence running through Glen Ogle and up the Tay valley to its head; down the river Lochy to Loch Awe, and down the river Awe and Loch Etive to **Oban**, the largest town (5,000) and principal tourist centre of the Western Highlands.

CHAPTER X.

IRELAND.

CONFIGURATION.

240. Ireland is divided into three parallel belts of approximately equal area, viz. (1) a northern mountainous belt comprising the old province of Ulster; (2) a central belt of almost unbroken plain, from Dundalk and Dublin on the east to the Atlantic on the west; (3) a southern mountainous belt, south of the Dublin-Galway line.

The mountains of Ireland form no such massive continuous uplands as the Highlands of Scotland, or even the Southern Uplands or the Pennine Range. They occur only in isolated groups of small extent. The largest area in Ireland above 1,000 feet high is in the **Wicklow Mountains**, and is only about thirty miles long and ten miles wide.

Ulster.

241. In the extreme north-east of Ireland the Plateau of Antrim has been built up, like Mull and Skye, of successive sheets of lava, a subsidence in which has produced **Lough Neagh** (about 150 sq. miles), the largest lake in the British Isles. The **Giant's Causeway**, near Portrush, exhibits columns of basalt like those of Fingal's Cave (§ 235).

South of Lough Neagh, between Dundalk and Downpatrick, extends a range of granite hills, of which the middle and highest part is known as the **Mourne** Mountains.

The Sperrin Mountains of Londonderry and the picturesque Highlands of Donegal are in geological structure a continuation of the Scotch Highlands, and exhibit in their glens and lakes the same persistent south-west and north-east direction. The two **Loughs Erne** occupy a broad transverse depression draining to Donegal Bay.

The Central Plain.

242. The **central plain** is composed of horizontal layers of limestone, formerly, it is supposed, covered with coal measures, which have been denuded. The plain is tilted up on the west into the mountains of Mayo and Connemara, but extends to the sea at Killala Bay, Clew Bay, and Galway Bay.

There are numerous island-studded lakes, of which the largest are Loughs **Conn, Mask,** and **Corrib,** on the edge of the western highlands, and Loughs **Allen, Ree,** and **Derg,** on the **Shannon.** Considerable areas of the plain are covered with peat bog; the remainder consists principally of meadow land.

The Southern Mountains.

243. The **Wicklow Mountains** closely resemble the Welsh Upland, of which they appear to be a detached portion. Their highest point is Lugnaculliagh (3,000 ft.). Groups of minor heights extend south-west from Wicklow to Waterford. The line of the **Slieve Bloom** and **Galtee** Mountains further west has the same general direction.

In the south-west of Ireland the mountain axes run almost due east and west, and there is a remarkable series of alternate valleys and ridges. The western ends of the valleys have been drowned, forming the rias of Dingle Bay, Kenmare River, Bantry Bay, and Dunmanus Bay, between the high parallel ridges, which further inland are divided by rivers flowing eastward. Between Dingle Bay and Kenmare River are the highest mountains in Ireland,

Macgillicuddy's Reeks, culminating in Carntual (3,400 ft.). They overlook the famous **Lakes** of **Killarney**. **Berehaven,** on an inlet of Bantry Bay, is a station of the British Atlantic fleet.

RIVERS.

244. Owing to the scattered grouping of Irish mountains and the almost dead level of the central plain, the courses of the rivers (except in the south-west) have little obvious relation to the land-relief, and the watershed between the eastern and the western rivers is a line which does not correspond with any marked surface features. The basins of the Shannon and the Barrow together cover nearly one-third of the country.

The **Shannon** (250 miles), the longest river in the British Isles, rises in County Cavan about twenty miles east of Sligo, and flows south and then south-west, across the central plain, expanding into numerous **lakes,** of which the chief are Loughs Allen, Ree, and Derg. At the southern end of Lough Ree is **Athlone,** an important military station with a thriving woollen industry. Below Killaloe, at the south end of Lough Derg, the river is hemmed in by Slieve Bernagh on the right and the Silvermine Mountains on the left, and flows through a narrow gorge.

Between Castleconnell and Castle Troy there are **rapids,** which are avoided by a short canal. Just below **Limerick** the river expands into an estuary about sixty miles long. The whole river is navigable to Lough Allen, except at the Doonass Rapids above-mentioned.

The largest tributary of the Shannon is the **Suck,** which joins it from the north-west halfway between Lough Ree and Lough Derg.

245. The other westward-flowing rivers of Ireland are quite short. In the south are a number of rivers flowing eastward through the long troughs of the southern mountains. Each river finally makes an abrupt turn southward, flowing through a gorge into the sea. These rivers, with the ports at their mouths, are: the **Bandon** (Kinsale), the

Lee (Cork and Queenstown), the **Blackwater** (Youghal), and the lower **Suir** (Waterford).

The last-named river rises in the mountains of North Tipperary, and flows nearly due south till it is diverted eastward by the Knockmealdown Mountains. After a course of 100 miles it flows into **Waterford Harbour**, the estuary of the **Barrow** (114 miles) and **Nore.** The former of these rises in the Slieve Bloom Mountains, and the latter within a mile or two of the source of the Suir.

The chief rivers of the east of Ireland, with the ports at their mouths, are: the **Slaney** (Wexford), the Ovoca (Arklow), the **Liffey** (Dublin), the **Boyne** (Drogheda), and the **Lagan** (Belfast). The **Ovoca** is remarkable for the rapidity of its fall; its source in the Wicklow Mountains (close to the source of the Liffey) is 1,770 feet high, while the whole length of the river is less than 35 miles.

The basin of Lough Neagh is drained by the river **Bann** (100 miles), which rises in the north of the Mourne Mountains, and flows north to **Coleraine**. Further west the **Foyle** flows past the old walled town of Londonderry into Lough Foyle. The river **Erne**, flowing into Donegal Bay, is little more than a string of lakes. In Connaught Loughs Mask and Corrib, joined by a subterranean channel, drain southward by the short river **Corrib** into Galway Bay.

Canals.

246. Belfast is connected with the upper Shannon at Carrick by the **Ulster Canal**, running from the Lagan to Lough Neagh, and thence west-south-west through Upper Lough Erne to Carrick.

Dublin is also joined to the Shannon by two canals across the plain. The **Grand Canal** runs nearly due west through Tullamore, joining the Shannon near Banagher, and the **Royal Canal** runs north-west through Mullingar, meeting the Shannon near Longford. A branch of the Grand Canal runs southward to the upper Barrow. Thus Dublin, Belfast, Limerick, and Waterford are all connected by inland waterways.

MINERALS.

247. Ireland is very poor in coal, the **only coal-field** worked to any extent being in the north of Kilkenny. The coal is of inferior quality, and the total production is less than one-thousandth of that of Great Britain. The industries of the north of Ireland depend on **imported coal,** and outside the large towns peat is generally used as fuel. **Iron ore** is mined only in Antrim, near Glenarm, and aluminium ores are found in the same district.

Ireland is rich in **building stones.** **Granite** is quarried in the Mourne Mountains and elsewhere, **limestone** is abundant, and the green and black **marbles** of the Connemara district of Galway are celebrated.

AGRICULTURE.

248. About half the area of Ireland consists of grazing land; about one-quarter is uncultivated or uncultivable; and another quarter is under crops or cultivated grass. The area of woodland is very small. **Oats, potatoes,** and **flax** are the most important crops, and these are all grown most largely (flax solely) in Ulster.

The warm south-eastern corner of Leinster (Wexford, Kilkenny, Carlow) grows **barley** for the breweries of Dublin. The remainder of Ireland consists almost entirely of pasture, mountain, bog, and lake. **Cattle** and **pigs** are more important than sheep.

The effect of the wet climate of Ireland is seen, not only in the predominance of **cattle**, but in the fact that while the Irish production of wheat is only about one-fortieth of that of Great Britain, the production of **oats** is as much as two-fifths of that of the larger island.

DISTRIBUTION OF POPULATION.

249. There are only three large towns in Ireland—**Belfast, Dublin,** and **Cork,** very symmetrically placed in the north, the centre, and the south. The towns of the second rank are **Londonderry, Limerick,** and **Waterford.**

There is a considerable density of population round Belfast Lough and Lough Neagh, and southward as far as Dundalk. The rest of the diminishing population of Ireland is very **evenly distributed** over the whole country, except the highlands of Donegal, Mayo, Connemara, and Kerry, where large tracts are uninhabited.

Rather more than **one-third** of the whole population is contained in the nine counties of Ulster, which form about one-quarter of the total area. The Irish of the west and south are a Celtic race, but in the "English Pale," round Dublin, many of the people are of English descent. In Ulster a large proportion of the population are of Scottish origin. The population of Ireland decreased by nearly 50 per cent. between 1841 and 1901. This decrease, unparalleled in any other country in modern times, has been due almost wholly to political and economic, not to geographical causes.

TOWNS.

250. Dublin, from its central position on the east coast, almost directly opposite Holyhead and the Cheshire gap, is marked out by nature for the capital of Ireland. It stands at the head of a fine bay, sheltered on the north-east by the Hill of Howth. Dublin is mainly a **governmental** city and distributing centre for Irish imports, but there are large **breweries** and **distilleries**, and other minor manufactures. It is also the chief outlet for the cattle and dairy produce of the south, centre, and west, lines of steamships running to Holyhead, Liverpool, Glasgow, Bristol, and London.

Six miles down the bay is **Kingstown** Harbour, to which the mail steamers run from Holyhead.

Belfast, at the head of Belfast Lough, is the only large manufacturing town in Ireland. The staple industry is the **linen** manufacture, the flax for which is partly grown in Ulster; but the imported flax, chiefly from Russia, amounts to about ten times as much as that grown locally; so that Belfast is in the rare position of having to import almost all its raw materials—flax, coal, and iron. The iron and coal of Cumberland, and the coal of southern Scotland, are, however, quite near, and sea transport is cheap. Belfast has become in recent years an important **shipbuilding** town. It is also the chief centre for traffic between the North of Ireland and Scotland and Northern England. Steamship lines run between it and **Heysham**, **Fleetwood**, and **Liverpool**, all Lancashire ports. The shortest sea passage between Great Britain and Ireland is that from **Stranraer** in Wigtown, to **Larne**, a few miles north of Belfast.

Cork, at the head of a fine land-locked harbour with numerous islands, has a large trade, chiefly with Bristol, in **butter**, bacon, and **cattle**. Its outport of **Queenstown**, on Great Island, is a calling-place for American mail steamers.

Limerick, **Waterford**, and **Wexford**, all situated on sheltered inlets, have similar trades to Cork. The curing of bacon is a most important industry in Limerick and Waterford. The country immediately behind Wexford is the richest agricultural district of Ireland, being both warm and relatively dry.

In the highlands of the west the small population is concentrated on the coast, and engaged chiefly in fishing. **Galway** and **Sligo** are the chief fishing ports.

In the north **Londonderry** exports the agricultural produce of the fertile lowland behind it.

Coleraine, at the mouth of the Bann, and **Newry**, near the head of Carlingford Lough, with which it is connected by the Newry Canal, are small manufacturing towns (linen) and minor ports. The only inland town of any size is **Kilkenny**, near the chief Irish collieries. **Ballinasloe**, on the Suck, near its junction with the Shannon, has great horse and cattle fairs.

RAILWAYS.

251. Ireland has four trunk lines of railway radiating from Dublin. The **Great Northern** line runs along the coast to **Dundalk**, and thence through **Newry**, Portadown, and Lisburn to **Belfast**; a branch diverges at Dundalk and runs through **Enniskillen** to **Londonderry**.

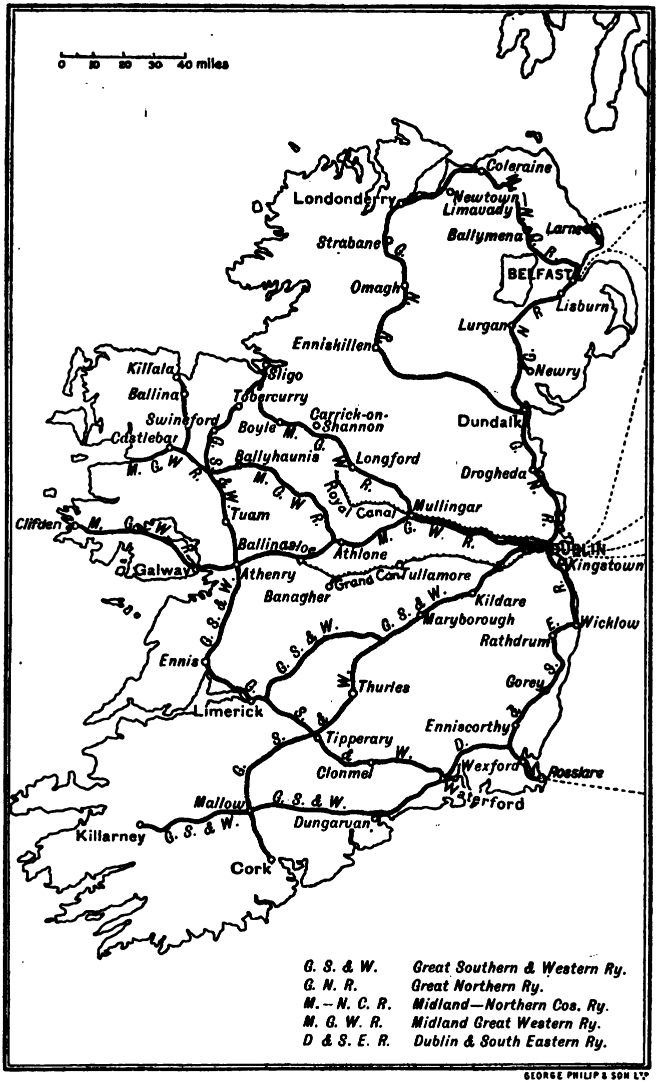

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Fig. 61.—Irish Railways.

The **Midland Great Western** line runs nearly due west through **Mullingar** and **Athlone** to Galway, with branches north-westward to **Sligo**, Ballina, Killala, and **Westport**, and westward to **Clifden**.

The **Great Southern and Western** line connects Dublin with Cork through **Kildare**, **Maryborough**, and **Thurles**. There are branches to **Limerick**, **Killarney**, and Waterford. Other lines connect **Limerick** with **Sligo** by **Ennis**, Athenry, and **Tuam**, and with **Waterford** by Limerick Junction and **Clonmel**.

The route of the **Dublin and South-Eastern** Railway is to some extent indicated by its old title: the *Dublin, Wicklow, and Wexford.* It runs through **Bray** and **Wicklow** and the splendid scenery of the Wicklow valleys to **Wexford**, New Ross, and **Waterford**.

Another important line is that known as the **Midland (Northern Counties of Ireland)**, which is really a continuation of the English Midland (via **Heysham** and **Belfast**), and connects Belfast with **Coleraine** and **Londonderry**.

CHAPTER XI.

THE BALTIC COUNTRIES.

I. *SCANDINAVIA.*

252. The Scandinavian Peninsula occupies the extreme north-west of Europe, between the Baltic Sea and the Atlantic. It contains the two kingdoms of **Norway** and **Sweden**, formerly ruled by one sovereign, but since 1905 entirely separate. The area is a little more than twice that of the British Isles, but the total population is very little more than that of "Greater London."

Configuration.

253. A long high plateau runs from north to south on the western side. It is wider and higher in the south than in the north, the highest points (8000 feet) being near the head of the Sogne Fjord.

The plateau is much intersected by rivers and glaciers. It slopes very steeply to the sea on the Atlantic side, and much more gradually towards the Baltic, eastern and southern Sweden being lowland, while almost the whole of Norway is mountainous, except a narrow coast-strip from Christiania to the Naze.

Coasts.

254. The western coast is highly indented, with long deep **fjords** penetrating far into the country, and is fringed with innumerable rocky islands, with sheltered waterways between them and the mainland.

The largest islands are the **Lofoden** Islands, near the south of which is the celebrated tidal race (improperly called a whirlpool) known as the **Malstrom**. The chief fjords are:—

Trondhjem,	Stavanger,
Sogne,	Christiania.
Hardanger,	

The Swedish coast is also highly indented, but the inlets are smaller and the coast is comparatively low.

Rivers and Lakes.

255. As the main watershed lies near the west coast the Atlantic rivers are much shorter than those flowing into the Baltic. The latter are very numerous, and nearly all flow south-eastward.

The largest Scandinavian river, the **Klar Elf** (200 miles), runs south into Lake Vener, which drains through the **Göta** river into the Kattegat. The **Glommen** (350 miles) runs nearly due south into Christiania Fjord. Waterfalls are frequent, and are an important source of power.

Lakes are very numerous, especially on the Baltic slope. The general direction is from north-west to south-east. No less than one-twelfth of the area of Sweden is occupied by lakes and rivers.

Lakes **Vener** (the third largest lake in Europe), **Vetter**, **Hjelmar**, and **Mälar** form an important group in the lowland of south Sweden. The first drains to the Kattegat, and the other three to the Baltic. Supplemented by canals joining them one to another and to both seas, they form a large system of inland navigation.

Climate and Productions.

256. There is the same climatic contrast between the east and west of Scandinavia as between the east and west of Great Britain; but the contrast is intensified by the greater height and width of Scandinavia.

The west coast has everywhere a mild, equable climate, with abundant rainfall (greatest in the neighbourhood of Bergen), and the harbours are never frozen. In the east the annual range of temperature is much greater, the winters are very severe, and the Gulf of Bothnia is frozen for several months. The rainfall on the east coast is generally less than 20 inches.

The mildness of the Norwegian climate is more than counterbalanced by the extremely mountainous nature of the country, much of which is above the snow-line. Only about one-fifth of the country is capable even of growing trees, while the cultivable area is only about 3 per cent.—chiefly round Christiania and Trondhjem.

The only part of the whole peninsula where **agriculture** is important is in the southern provinces of Sweden—Scania and East and West Gothland. **Oats, rye,** and **barley** are the principal crops. **Dairy products** are also important, and butter is a considerable export.

The chief wealth of the peninsula lies in its immense **forests** of pine and fir, especially in Sweden, more than half of which is wooded. Timber is largely exported, and manufactures of **joinery, wood-pulp** for paper, and **wooden matches**, are carried on.

The barrenness of their country has made the Norwegians, from the time of the Vikings to the present day, a race of bold sailors and fishermen; **fish** (cod and herring) and **fish-products** (*e.g.* cod-liver oil) form their most important exports after timber. **Bergen**, the second town in Norway, is the chief centre of the fish trade of Northern Europe. Cod-fishing is carried on principally round the Lofoden Islands.

257. Sweden is rich in **minerals**, especially in **iron** ore, which is the best in the world. Most of it is exported as ore, but there is a growing **steel** manufacture, charcoal being used for smelting instead of coal. The iron ore occurs chiefly at **Dannemora**, north of Stockholm, and at **Gellivara**, about one degree north of the Arctic Circle.

For the development of the Gellivara mines a railway—the most northerly in the world—has been built from **Lulea**, at the head of the Gulf of Bothnia, to **Narvik** on the Ofoten Fjord, opposite the Lofoden Islands, thus providing Gellivara with an ice-free port in winter.

Towns.

258. Bergen and the iron towns have been already mentioned. **Trondhjem**, the third town in Norway and the ecclesiastical capital, is an important tourist centre. **Christiania**, the capital and chief commercial town of Norway, is in the centre of the only considerable lowland area of that country, and has easy communications northwards by the Glommen valley.

Stockholm, the capital of Sweden and the "Venice of the North," is a somewhat larger town and is built mainly on islands between the sea and Lake Mälar. It is thus the eastern gateway of the lake navigation of Sweden. In southern Sweden **Göteborg**, on the Kattegat, is the chief port for Swedish exports, and further south are the smaller ports of **Malmö** and **Helsingborg**. **Carlskrona**, on the Baltic, is a naval station. The only large inland towns are **Jönköping** (famous for matches), at the south end of Lake Vetter, and **Norrköping**, the chief manufacturing town of Sweden, on the Motala River, half-way between Lake Vetter and the sea.

In the north of the peninsula **Lulea** and **Umea**, on the Baltic, export ores and wood in summer; and **Bodö**, **Tromsö**, and **Hammerfest**, on the Atlantic, all within the Arctic Circle, are small fishing and tourist centres.

II. DENMARK.

259. The Kingdom of **Denmark** is about twice as big as Wales, and also contains about twice as many people. It consists of the Peninsula of Jutland (one of the very few northward-pointing peninsulas of the world), and the islands between the Kattegat and the Baltic.

The islands have an area about one-third that of the whole country, but contain more than half the population. The chief islands are **Zealand**, **Fünen**, Laaland, and Falster.

Denmark is historically important from its control of the channels into the Baltic—the **Sound**, the **Great Belt**, and the **Little Belt**. The Sound, guarded by **Elsinore** on the north and **Copenhagen** on the south, is the channel most used by shipping, though its importance has declined to some extent since the opening of the Kaiser Wilhelm Canal across the isthmus of Schleswig-Holstein, from the mouth of the Elbe to Kiel (§ 273).

Configuration and Coasts.

260. The whole country is **lowland**, no part of it rising to 600 feet. Heather moors and peat bogs cover a considerable part of northern Jutland.

The west coast is low and uniform. There are, however, a number of large **lagoons** lying behind sand-bars. The chief of these is the so-called **Lüm Fjord**, which stretches right across the north of Jutland. Except Copenhagen, there is no harbour in the whole country which can accommodate large ships.

Climate and Productions.

261. Denmark lies in the same latitude as southern Scotland, and has a similar climate, with rather greater extremes of temperature.

The productive portion of the country is about four-fifths of the whole, consisting in about equal proportions of arable land and pasture.

The productions of Denmark, however, are much more like those of Ireland than of Scotland.

There are large crops of barley, oats, potatoes, and beetroot; and many cattle and pigs. Denmark leads the world in scientific **dairy farming**, and the exports consist almost solely of foods—**butter, cattle,** and **swine** being the principal. There are no minerals of any importance, and almost all manufactured articles have to be imported.

Towns.

262. The only large town is **Copenhagen,** which with its suburbs has nearly half a million inhabitants, or one-fifth of the whole population. The towns of the second rank are **Aalborg** and **Aarhuus,** in the east of Jutland, and **Odense** in Fünen. **Esbjerg,** in the south-west of Jutland, is a small port which sends cattle to England.

The Danish islands are connected with Jutland and with Malmö in Sweden by ferry-steamers which carry trains across the straits.

Iceland.

263. This large island, situated in the North Atlantic, just south of the Arctic Circle, and nearer America than Europe, has been a Danish possession since 1389. It is somewhat larger than Ireland, but contains fewer inhabitants than Cork. The island is high, and on three sides the coast is indented by many **fjords**, only the south coast being low and unindented.

About four-fifths of the area is **uninhabitable**, being occupied by mountains, snowfields, and great plateaus of lava. **Hekla** and a few other volcanoes are still active. There are many hot springs, of which the **Geyser** is the best known.

The lowlands of the south and west have a mild climate, and contain good pastures, on which many cattle and sheep are reared. **Fishing** is important. There is only one town, **Reykjavik**, on a bay in the south-west.

III. THE NORTH GERMAN PLAIN AND POLAND.

Configuration and Coast.

264. The coast of the German Plain is low and sandy, with large lagoons behind sand-bars at the mouths of the rivers. The chief lagoons are the **Stettiner** Haff, at the mouth of the Oder, the **Frisches** Haff, between the mouths of the Vistula and Pregel, and the **Kurisches** Haff, at the mouth of the Memel or Niemen.

Behind the coast, from the Elbe eastward, is a low ridge known as the **Baltic Heights**, nowhere exceeding 1,000 feet, and generally below 600. It is a rather infertile region full of small morainic lakes. Southward of the Baltic Heights the plain extends unbroken to the **Central Highlands**. It is much wider in the east, where it reaches to upper Silesia, near the sources of the Oder and Vistula, than in the west, where it is bounded by the **Harz Mountains**, between the Elbe and the Weser, and by the Weser Heights and the **Teutoburger Wald**, between the Weser and the Ems.

Rivers.

265. Of the rivers of north Germany the Ems and Weser alone are wholly German from source to mouth.

The **Ems** is a quite small river which rises in the south of the Teutoburger Wald, and flows round the western end of that range and close to the Dutch frontier into the North Sea. It is connected by canal with the Rhine, via Dortmund and the Ruhr coal-field.

The **Weser** (380 miles) is formed near Göttingen by the confluence of two streams flowing from the Thuringer Wald and the Hessian Heights. Only its lower course is across the plain. The river leaves the highlands near **Minden** through a narrow gorge in the Weser Heights, which is known as the **Westphalian Gate**, and provides an easy route from the Rhine valley to the northern plain.

266. The **Elbe** (690 miles) rises on the southern slope of the Riesen Gebirge, and its upper course is across the mountain-rimmed basin of Bohemia. The river has cut a fine gorge through the Erz Gebirge, and enters the German Plain at **Dresden**. Its chief tributaries are, in Bohemia, the **Moldau**, rising in the Böhmer Wald; in Germany, on the left bank, the Mulde and the **Saale**, flowing north from the Central Highlands; and on the right bank the Havel, a river belonging wholly to the plain, and expanding into many lakes. The Havel and its tributary the Spree are connected by canals with the Oder. The Elbe itself is navigable, except in very dry seasons, to Prague on the Moldau.

The **Oder** (580 miles) is almost wholly a German river, but its source lies just beyond the Austrian frontier, in the ~~Moravian~~ Highlands. The river is navigable almost up to the frontier. Its largest tributary, the **Warthe**, is connected by its sub-tributary, the Netze, and a short canal, with the Vistula, where the last-named river makes a sharp turn to the north-east.

267. The **Vistula** (630 miles) rises in the north of the Carpathian Mountains, and for about 100 miles from Cracow forms the northern frontier of Austria. It then flows north-west through the middle of **Poland**, entering German territory at **Thorn**, whence its course is nearly due north to the Gulf of Danzig.

The other rivers of Germany, except the **Niemen**, which is almost wholly Russian, belong to the Rhine and Danube systems (Chap. XII.).

Climate.

268. The western part of the plain has a **climate** somewhat similar to that of eastern England, but with colder winters; the mouth of the Elbe is only kept open in January by ice-breakers. In the eastern plain the summers are somewhat hotter and the winters very much longer and more severe, the contrast becoming greater the farther east we go. The Vistula at Warsaw is frozen for about two months every year, and all the Baltic ports are closed by ice for shorter or longer periods.

Agricultural Productions.

269. The staple crops of the German Plain are **rye, oats**, and **potatoes**. **Sugar-beet** is very largely grown, especially in the middle valley of the Oder, and in the west between the Elbe and Weser. Sugar refineries are important in these districts, especially at **Frankfurt-am-Oder** and at **Magdeburg**. **Flax** and **hemp** are grown chiefly in the north-east round the lower Vistula.

About one-fifth of the plain is **forested**, the chief timber tree being the Scotch **pine**; there are fine **beech** forests along most of the Baltic coast, especially in Pomerania. There are fewest trees in the north-west of the plain, where open moors and heaths predominate.

Domestic animals are reared in large numbers. Germany has nearly twice as many **cattle** as the United Kingdom, and four times as many **pigs** (largely fed on the refuse of the beet-sugar industry); but it contains less than half as many sheep.

Minerals.

270. The minerals of the German Plain are chiefly found, as is the case in England, on its hilly borders. The chief **coal-mining** district is in upper Silesia, on the right of the Oder. The coal-field is shared by three nations, as it extends into Austrian Galicia and Russian Poland. **Königshütte** is the chief mining centre. The same district contains some of the most important **zinc** ore deposits in the world.

North-west of the coal-field **iron** ore is found above and below **Breslau.** A smaller coal-field lies south-west of Breslau on the edge of the **Sudetes** Mountains, and there is another in **Saxony,** north of **Chemnitz.**

At **Stassfurt,** a few miles south of Magdeburg, there are large deposits of **rock-salt,** and above them a bed of **potash salts** (found nowhere else in the world), which has given rise to important **chemical** manufactures.

TOWNS AND INDUSTRIES.

271. Berlin, the capital of the German Empire, and the second largest town in continental Europe (about 2½ million inhabitants, including suburbs), has grown to greatness in the last two centuries with the development of Prussia from the small Duchy of Brandenburg into a great power. The town owes much to its central position on the plain, and its **water-communications** east and west with the Oder and Elbe. It has become a focus of railways from all parts of Europe. Like all large capitals, Berlin has also become a great manufacturing city, making especially machinery, clothing, porcelain, and articles of art and luxury.

Seaports.

272. Hamburg, on the right bank of the Elbe, at the head of its long estuary, is the greatest seaport, not only of Germany, but of continental Europe. Including the "twin city" of **Altona** just below it, there are over a million inhabitants.

Cuxhaven is an outport at the lower end of the estuary, where incoming ships take pilots on board. Hamburg has excellent communications with south-eastern Germany by the Elbe and Oder river and canal systems, and nearly all the goods traffic between Hamburg and Berlin is by water.

273. Bremen, with its outport of **Bremerhaven,** occupies a position very similar to that of Hamburg, but not so advantageous for inland traffic.

A projected canal, joining the Elbe at Magdeburg with the Weser at Minden, and continued to the Ems, would probably add greatly to the importance of Bremen.

The only other North Sea ports of Germany are **Emden,** a coal port at the mouth of the Ems, and **Wilhelmshaven,** on Jade Bay, west of the Weser mouth. The latter port is the North Sea base of the German Navy. The Baltic naval base is **Kiel,** and by means of the **Kaiser Wilhelm Canal** (see § 259) warships can be rapidly concentrated in either the North Sea or the Baltic. Kiel is also a port of considerable commercial importance.

274. Of the Baltic seaports of Germany **Lübeck** was in mediaeval times by far the most important. It has relatively declined, but is still a considerable port, connected by canal with the Elbe above Hamburg. **Stettin,** with its outport of **Swinemünde,** has the whole navigable Oder as far as Upper Silesia for its hinterland, and is also important as the port nearest to Berlin. It has extensive ship-building yards and is rapidly growing. **Danzig** is the chief commercial centre of eastern Germany and the port also of Russian Poland, exporting much wheat and timber brought down the Vistula. **Königsberg** and **Memel,** still further east, have similar trades.

Inland Towns of the Plain.

275. Warsaw, almost in the centre of Poland, at the head of steam navigation on the Vistula, and on the direct route from central Europe to Moscow, is the third largest town in **Russia,** and the seat of many industries. **Lodz,** in south-west Poland, has grown in about half a century from little more than a village into the fifth town in **Russia**, owing to the great cotton and other textile manufactures which have arisen there in consequence of local coal and iron.

In the east of the German Plain **Thorn**, **Posen**, and **Breslau** are important fortresses commanding the Russian frontier. Each of them, it may be noted, is at a point where east and west routes cross large rivers flowing north. **Breslau** is also the commercial capital of the rich mining district of Silesia, and a seat of **woollen** and **iron** manufactures.

Spandau, **Magdeburg**, and **Küstrin**, further west, are the central fortresses guarding Berlin. Küstrin commands the crossing of the Oder, and Magdeburg that of the Elbe, while Spandau is the citadel of the capital itself.

Hanover, once the capital of a kingdom, is now important as the place where the chief railway line from Holland to Berlin crosses the chief line from Hamburg to southern Germany.

Saxon Towns.

276. The Kingdom of Saxony belongs only partly to the plain, the south of it being on the slopes of the Riesen Gebirge. The district where the Elbe breaks through the mountains is a very picturesque region known as "**Saxon Switzerland.**"

Saxony is the **most densely peopled** state in Europe, having over 700 inhabitants per square mile. This is chiefly due to the coal-field near **Chemnitz**, which is one of the chief centres of the German textile industries, especially **cotton**.

Dresden, on the Elbe, just at the exit from the mountains, owes its importance chiefly to its rank as the capital of Saxony, and is a large residential town, famous for music and art. "Dresden" china is made at **Meissen**, lower down the river. **Leipzig**, on a tributary of the Saale, is important as the place where several routes from south-west Germany and from Austria converge on to the plain.

It is the fourth largest town in Germany, and the centre of the German **book trade**.

The lower valley of the **Rhine** is separated by no physical barriers from the North German Plain; but its description is postponed to Chapter XII., where the Rhine is treated as a whole.

IV. RUSSIA IN EUROPE.

Area and Boundaries.

277. European Russia covers an area of nearly two million square miles, or rather more than half of Europe. It is about 16 times as large as the British Isles, but only contains about 2½ times as many people.

The land boundaries are mostly conventional, not coinciding with any natural surface features, except on the Rumanian frontier in the south-west. In the east the political boundary runs considerably to the east of the southern **Ural Mountains** and considerably to the west of the **Ural River.** In the south Cis-Caucasia (the belt north of the Caucasus Range, between the Caspian and Black Seas) is officially included in European Russia, but geographers generally reckon Europe to end at the depression through which the Manych runs, from near the Caspian to the mouth of the Don.

Configuration and Coasts.

278. Though its rivers rise in three distinct mountain systems, and flow into four widely separated seas, Russia is more homogeneous than any other large state in the world. Except for the Ural Mountains almost the whole area is lowland. It rises a little north-west of the centre to about 1,000 feet in the **Valdai Plateau,** a great water-parting in spite of its insignificant height.

There are minor ridges running (1) north-eastward to the Urals, (2) along the right banks of most of the southern rivers, these banks thus presenting a strong contrast to the low left banks. The line of the Baltic Heights is continued near the coast from Prussia to the Gulf of Finland.

Finland is a low **plateau** (400-600 feet) in the hollows of which are innumerable **glacial lakes**, occupying together about one-third of the area. The coast of Finland is high and rocky, and fringed by many small islands.

The Baltic coast further south, like the German coast, is low, sandy, and unindented, except by the large **Gulf of Riga**. The north coast of the Black Sea is generally high, except near the mouths of the rivers.

Rivers.

279. The watershed between the northern and the southern rivers is a sinuous line running N.N.E. from Galicia to the Valdai Hills, and then E.N.E. to the Urals. The Baltic rivers, apart from the **Vistula**, already mentioned, are the **Bug**, its chief tributary, which rises in Galicia in the foot-hills of the Carpathians, and joins the main river below Warsaw; the **Niemen** (400), flowing past Tilsit into the Kurisches Haff; the **Western Dvina** or Duna (550), rising in the Valdai Hills close to the source of the Volga, and flowing to the Gulf of Riga; the short but large river **Neva**, discharging Lake Ladoga by four channels into the Gulf of Finland; and the numerous short rivers of Finland. The river **Svir** joins Lake Onega to Lake Ladoga, which also receives the **Volkhov** from Lake Ilmen.

The northern slope of Russia is drained chiefly by the **Onega** and the **Northern Dvina** (700) into the shallow White Sea; and by the large but useless **Petchora** (900), flowing from the Urals, over the great tundra, into the Arctic Ocean, north of the Arctic Circle.

280. The rivers of the south-eastern slope of Russia are much more important than those of the north and west, partly by reason of their greater length, and partly from the fact that they flow through more fertile regions. Of the **Black Sea Rivers**, the **Pruth** (360), the lowest tributary of the Danube, rises in the Carpathians, and forms for nearly its whole course the frontier between Russia and Rumania. Next come the nearly parallel but longer **Dniester** (700), the **Bug**, and the much larger **Dnieper** (1,200), the third longest river in Europe. The last-named rises only a little south of the Volga, and has three large tributaries: the Beresina from the north; the Pripet from the west, flowing through a region of widespread marshes as large as Ireland, now being drained and reclaimed; and the Desna from the north-east.

The **Don** (1,000) rises near Tula on the south of the central plateau, and flows south-east and then south-west into the Sea of Azov. Its chief tributary is the **Donetz,** or Little Don, on the right bank.

The **Volga** (2,200), the longest river in Europe, rises in the Valdai Hills, and flows east to **Kasan,** receiving on the right bank, at **Nizhnii-Novgorod,** its largest tributary, the **Oka,** from the south of the central plateau. The Volga then flows south, receiving the **Kama** and the **Samara** from the Ural Mountains, and, after a sharp turn at Tzaritzin, where it is within about 40 miles of the Don, flows south-east, through a large delta with more than sixty mouths, into the Caspian Sea. The lower course of the river is below sea-level.

Inland Navigation.

281. The larger Russian rivers are generally **navigable,** at any rate by barges, through nearly their whole length. The rivers rising in Central Russia are so near together, and the ground is so level, that it has been easy to connect them by **canals.** Vessels carrying as much as 1000 tons can pass from the Volga to the Neva, and barges can go from the Black Sea to the Baltic by way of the Dnieper and the Vistula or the Duna.

River navigation, however, is subject to various **disadvantages.** It is stopped in winter for varying periods by ice. The Volga at Astrakhan (in about the same latitude as Venice) is frozen for about three months; the Northern Dvina at Archangel for more than six months. Another disadvantage is that in the summer droughts some of the rivers, especially the southern ones, become

too shallow; so that river navigation is only important during the spring floods and early summer.

A canal to connect the lower Volga with the Don is much needed, so as to enable the produce of the Volga basin to reach the Black Sea direct, instead of going by train from Tzaritzin to the Don.

Climate and Vegetation.

282. The climate of Russia is everywhere **continental** and comparatively dry. The **rainfall** diminishes, and the annual range of temperature increases, towards the south-east, where the summers are sub-tropical and the winters Arctic. The average annual rainfall in southern Finland is about 24 inches, at Kiev 21, at Orenburg 16, and at Astrakhan only 6 inches. Thus the wettest parts of Russia only have as much rain as the driest parts of Great Britain.

The southern slope of the **Crimea**, shielded on the north by the Yaila Tagh (a prolongation of the Caucasus Range), has a climate and products like those of Mediterranean lands, and is the only part of Russia where the average winter temperature does not go below the freezing-point.

283. The belts of vegetation in Russia extend from west to east. In the extreme north are the **tundras**, growing only poor pasture for reindeer, and almost uninhabited. Then comes a great **forest** belt, chiefly pine and birch. About two-fifths of Russia is forested, and the forests are almost wholly in the north and centre. The rivers of the north and west are largely used for floating timber to the sea. The brown bear, wolf, and elk are found in the forest region and on the borders of the steppes.

In south central Russia is the famous "**black earth**" region, extending from the Carpathian Foreland to the middle Volga. It is a region of great fertility, growing enormous quantities of **grain**—wheat for export, and rye and oats for home consumption. **Flax** and **hemp** are large crops in Poland and the Baltic provinces.

South and east of the black earth region are the bare monotonous **steppes**, snow-covered in winter, carpeted with grass and flowers in spring, and burnt up in summer. They extend from the north of the Black Sea to the Caspian Depression, and beyond it into Central Asia.

The steppes were until recently inhabited almost solely by **nomadic pastoral races**—Cossacks, Kalmucks, and Kirghiz; but agriculture is rapidly extending wherever the rainfall is adequate, and also in the river valleys where irrigation is easy.

Minerals.

284. Russia is rich in minerals, and mining and the manufactures dependent on it are rapidly extending. The chief **coal-fields** are (1) between the upper Don and the Oka, round **Tula**, (2) in the basin of the Donetz, (3) in south-west Poland, (4) on the western slope of the Urals, north-east of **Perm**.

Iron is also widely distributed, being found on or near the coal-fields (1), (2), and (4) above mentioned, and also (4) at **Krivoi Rog**, between the lower Dnieper and the Bug; (5) south of the Pripet marshes, near **Kiev**; (6) in many parts of the Finland lake region.

The southern Ural Mountains are rich in **platinum, copper,** and **gold. Yekaterinburg** is the chief mining centre.

Population.

285. Russia is still predominantly an agricultural country, and the great majority of the inhabitants dwell in small villages. There are no dense centres of population comparable with the industrial areas of England or Germany, and, in spite of the recent growth of factories, a large majority of the industrial population of Russia still work in their own homes. Only about 2 per cent. of the population are engaged in manufactures.

North of the latitude of Riga and Moscow the whole country is very sparsely populated, and contains no very large town except **St. Petersburg**. The steppes of the south-east have also a very small population, as have also the great marshes of the Pripet.

The only considerable areas with a moderately dense population are **Poland**, and the "**black earth**" region, especially that part of it between the Dnieper and the Dniester.

Seaport Towns.

286. St. Petersburg is an artificial capital created by Peter the Great to consolidate and Russianise his Baltic conquests. With the continuous expansion of Russia in the last two centuries the capital has grown into one of the largest and stateliest European towns. It is built on both sides of the Neva and on islands in the river, and, since it was made accessible to large vessels by a ship canal, has become the chief Russian seaport. There are large manufactures of porcelain, tapestry, and other art work, as well as of textile fabrics and machinery.

About 15 miles west of St. Petersburg the naval harbour of **Kronstadt**, on an island, is the centre of a line of powerful forts extending right across the Gulf of Finland.

287. Archangel, at the mouth of the Northern Dvina, exports, during the few months when it is free from ice, the products of the northern forests and also fish and fish products (train oil, etc.).

Archangel is connected with Moscow by rail, and its importance has lately been increased by the construction of the railway from Perm to Kotlas on the Dvina, which makes Archangel to some extent a port for the southern Urals, and even for Siberia.

288. The largest Baltic port of Russia, after the capital, is **Riga**, on the Western Dvina, a great port for grain, timber, hemp, and flax, the staple products of its hinterland. Its outport is **Dünamünde**, at the mouth of the river. In Finland the ports are **Helsingfors**, the capital, **Abo**, and **Viborg**, all exporting chiefly grain and timber.

The chief Russian port on the Black Sea is **Odessa**, which exports most of the wheat of southern Russia. As the harbour is actually on the sea, and not at the mouth of a river, the port is less often closed by ice than most of the others. **Nicolayev**, at the mouth of the Bug, and **Sevastopol**, in the south of the Crimea, are the bases of the Black Sea

Fleet; the former is also a growing **commercial port. Kherson**, near the mouth of the Dnieper, is a rival of Odessa in the wheat trade.

Astrakhan, the chief port of the Caspian, is a centre of important fisheries, especially of sturgeon, from the roe of which caviare is made.

Inland Towns.

289. Moscow, the capital of Russia till the foundation of St. Petersburg, is situated almost exactly in the centre of the country, on the small river Moskva, a tributary of the Oka. It has over a million inhabitants, is a great focus of roads and railways, and a great seat of industries, making all kinds of textile fabrics and metal work.

Tula, about 100 miles south of Moscow, is the centre of a **coal** and **iron** district, and has important manufactures of **rifles** and other weapons, **cutlery**, and **machinery**. It is at once the Sheffield and Birmingham of Russia, though very much smaller than either of the corresponding English towns. **Nizhnii-Novgorod**, at the junction of the Oka and the Volga, is famous for its great **annual Fair**, to which come many caravans from all parts of Asia, to exchange the products of the East for those of the West.

In the most fertile part of the black earth region, known as "Little Russia," the chief towns are **Kiev**, the commercial centre of the Dnieper basin, and **Kharkov**, on the Donetz.

The chief towns of the Volga basin, apart from those already mentioned, are **Perm**, at the head of navigation on the Kama, and near the great Ural mining district; and **Kazan**, **Samara**, and **Saratov**, on the main river. The last is the chief centre of Russian tobacco cultivation. **Samara**, situated at the end of a long eastward loop of the Volga, is growing in importance from the fact that two very important railways diverge from there, viz. the great Siberian Railway to Vladivostok, and the Central Asian Railway, running through **Orenburg**, at the south of the Ural Range, to the steppes of Turkestan and the borders of Afghanistan.

CHAPTER XII.

CENTRAL EUROPE.*

I. SWITZERLAND.

Position and Boundaries.

290. Switzerland is the most central country in Western Europe. Berne is almost equally distant from Lisbon, Sicily, Bucharest, Königsberg, and Aberdeen. The country is also central in another and more important sense, as its rivers flow to the Black Sea, the Adriatic, the Mediterranean, and the North Sea. Moreover, Switzerland is a "**buffer state**" between four of the six "Great Powers" of Europe—France, Germany, Austria, and Italy.

The **boundaries** of Switzerland, though partly conventional, mostly follow well-marked natural features:—the Jura Mountains on the north-west; the Rhine and Lake Constance on the north and north-east; the Italian frontier is the main crest of the Pennine and Lepontine Alps from the Great St. Bernard nearly to the St. Gothard, but the Canton of Ticino descends to the edge of the Plain of Lombardy, and includes the northern part of Lake Maggiore and nearly the whole of Lake Lugano.

Configuration.

291. Switzerland consists of three distinct belts running from south-west to north-east, viz. (1) the Western and Central **Alps** in the south and east, (2) the **Jura**

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* For convenience of treatment France and the Low Countries are here dealt with as part of Central Europe.

Mountains in the north-west, and between them (3) the **Swiss Plain**, from Lake Geneva to Lake Constance.

The **Alps** and their main passes have been already described (Chap. VI.). The main **river features** of the country are (1) the longitudinal valleys of the **Rhine** and **Rhone** as far as the lakes above-mentioned; (2) the transverse valleys of the **Aar** and the **Reuss** on the north, and of the **Ticino** on the south; (3) the longitudinal valley of the upper **Inn**, a famous health and pleasure resort known as the Engadine.

Nearly the whole of the Swiss plain is drained by the **Aar** and its tributary the Saane, the rivers flowing into Lake Geneva from the north being quite short.

The **Reuss**—a very important northward route from the St. Gothard—only joins the Aar a few miles above the confluence of the latter with the Rhine.

Climate and Vegetation.

292. Rainfall is everywhere abundant, except in very sheltered valleys; the **temperature** naturally varies with elevation. On the plain the average summer temperature is about the same as in southern England, but the winter is about 10° colder. The hot **Föhn** wind (§ 41) is an important element in the climate of some of the valleys.

Nearly one-third of the surface of Switzerland is entirely **unproductive**, consisting of bare rock and snow or ice. This area is of course mostly in the High Alps.

Of the productive area about one-third consists of pasture-grass, another third of forests, and the remainder of fruit gardens and crops. The lower valleys grow **vines**, **wheat**, and even maize. At a slightly higher level are deciduous **forests** (chiefly beech) and crops of **rye** and **oats**. The evergreen forests of **firs** and **pines** occur between about 4,000 and 6,500 feet, and above them are grass meadows furnishing summer pasture for cattle.

Above 8,000 feet is a dwarf Alpine flora resembling that of the tundra. The snow line is about 9,000 feet high. On the northern slopes of valleys all the belts of vegetation are at a rather higher level than on the southern slopes, which face north, and therefore receive less sunshine.

Towns and Occupations.

293. Switzerland has no coal-fields, and has to **import** not only coal, but most of its food, and also nearly all the raw materials for its manufactures; even wood has to be imported. The country has one important asset, however, in the **water-power** of its rivers and falls, which is used in all kinds of industries.

On account of the necessity for importing almost everything, Swiss manufactures are chiefly those in which the finished product is of high value in proportion to its bulk. This is especially the case in the making of **watches** and **clocks**, which is carried on in the villages of the Jura and all over western Switzerland. **Geneva**, finely situated at the foot of its lake, is the commercial centre of this manufacture.

In the north of Switzerland, from **Berne** and **Basel** to Appenzell, the staple industry is the making of **textile** fabrics, especially cotton and silk. Raw silk comes from Italy by the St. Gothard route, and raw cotton is imported chiefly by way of the Rhine. **Zürich**, on L. Zürich, the largest town in Switzerland, is the chief centre of manufactures. **Machinery** is made in all the principal towns, and **electro-chemical** works are rapidly growing, owing to the cheapness of water-power. The chief industries connected with agriculture are the manufacture of **cheese** and **condensed milk**, which are made wherever there is good pasture, and are among the principal exports of the country. There are ten times as many cattle as sheep in Switzerland.

Basel, the north-western gateway of Switzerland, at the point where the Rhine turns north, is a very important route town, at the intersection of the St. Gothard route from Italy to Germany with one of the main lines from France to Austria, via Zürich and Innsbrück. **Berne**, in the centre of the plain, the federal capital of Switzerland, is chiefly an administrative and official city, and is the headquarters of several international organisations, *e.g.* the Postal Union.

The "tourist industry" is very important in Switzerland. Nearly all the towns round the lakes are tourist resorts, of which **Lucerne** is the largest. **Interlaken**, on a delta between Lakes Thun and Brienz, **Zermatt**, at the foot of the Matterhorn (nearly 15,000 feet), in a side valley of the Rhone, and **Chamonix** (in France), near Mont Blanc (nearly 15,800 feet), are centres for Alpine climbers. In eastern Switzerland **St. Moritz** and **Davos Platz** are well-known health resorts.

II. THE CENTRAL HIGHLANDS OF EUROPE.

294. The mountains of **central Europe** enclose a large and very complex region, extending from central France to Rumania, and from the Harz Mountains to the edge of the Plain of Lombardy. They are bounded on the west by the coast plain of France and the Low Countries, from which rise the isolated minor uplands of Brittany and Normandy.

North-West France.

295. Brittany is the French counterpart of Cornwall. It is a hilly country, with much barren moorland in the interior. The deeply indented coast strip is well cultivated, but the activities of the Bretons are mostly on the sea, the **sardine** fishery, of which **Nantes** is the chief centre, especially being important. **Brest** and **Lorient** are important naval stations, and **St. Malo**, with the adjoining town of **Dinard**, is a fishing and tourist centre. There is little fishing at St. Malo itself, but a large fleet leaves there every year for Newfoundland. St. Malo exports large quantities of potatoes.

The **Channel Islands**, north of St. Malo, are under **English** rule, though they have their own constitution and laws. They grow early vegetables and fruit for the English markets, and are much visited by tourists. The chief islands are Jersey, Guernsey, and Alderney; **St. Helier** in Jersey is the chief town. Both Jersey and Alderney are famous for breeds of cattle.

296. Normandy is a hilly well-wooded region extending from Brittany to the lower Seine (see §§ 307-8). It is famous for its **apples** and **cider**, and contains many fine old churches and abbeys. At the end of the flat peninsula of Cotentin stands **Cherbourg**, the chief naval fortress of France on the Atlantic, in a position closely corresponding with that of Portsmouth on the English side of the Channel.

Central France.

297. The **Central Plateau** of France is cut off from the Alps and Jura by the deep narrow Rhone-Saône valley; the steep eastern and southern edge of the plateau is composed of the **Cevennes** Mountains, which rise to nearly 6,000 feet. North-west of the Cevennes are the **Auvergne** Mountains, a picturesque region of old volcanic cones, two of which, Mont Dore and the Plomb du Cantal, are over 6,000 feet high.

To the north-east the Central Plateau is separated by a slight depression from the Mountains of **Morvan** and the **Côte D'Or**. The latter hills are only separated by a narrow gap—the **Strait of Côte D'Or**—from the small plateau of **Langres**, which is nearly continuous with the southern Vosges.

Central Highlands.

298. The **Vosges** and the **Schwarzwald** are parallel ranges of pine-clad hills extending north and south on opposite sides of the Rhine, which flows between them in the middle of a broad rift-valley. Further north the **Rhine Highlands** extend on both sides of the river, which has cut a very picturesque narrow defile through them from Bingen to Bonn. A westward extension of the Rhine Highlands, known as the **Ardennes**, stretches across southern Belgium into France.

The isolated range of the **Harz** Mountains is the most northern of the Central Highlands, and descends steeply to the plain on the north. The highest point is the **Brocken** (3,658 feet), which has many literary associations. The range is rich in silver and lead ores.

The **Fichtelgebirge**, a group of mountains situated where Saxony, Bohemia, and Bavaria meet, is a "knot" from which four distinct ranges diverge, viz. the **Thüringerwald** to the north-west, the **Böhmerwald** to the south-east, the **Erzgebirge** to the north-east, and the **German Jura** (called Franconian Jura in Bavaria and Swabian Jura in Württemberg) to the south-west.

The first two of these, as the name implies (*wald* = forest, cp. English *weald*), are well wooded, and have gentle slopes. The **Jura** is a succession of bare limestone ridges, and the **Erzgebirge**, though not very high (less than 5,000 feet), contain some of the wildest mountain scenery in Europe.

The **Bavarian Plateau** is a broad terrace with an average height of about 1,600 feet, extending from the Alpine Foreland in the south to the valley of the Danube. It is bounded eastward by the valley of the Inn, and westward by the Swabian Jura. It is similar in character to the Swiss Plain, of which it is really a continuation.

Bohemia is a **basin** about 1,500 feet in height, almost completely encircled by mountains—the Böhmerwald, Erzgebirge, Riesengebirge, and Sudetes on the west, north, and east, and the broader but lower Moravian Highlands on the south. Except through the defile by which the **Elbe** enters Germany, Bohemia cannot be entered by any route less than 1,500 feet high. The basin is drained centrally by the Moldau, rising in the south of the Böhmerwald, and joining the Elbe below **Prague.**

299. After the Alps, the **Carpathians** are the most extensive mountain system in Europe, though they are not so high as the Pyrenees. Beginning north of Pressburg on the Danube with the **Little Carpathians**, the range extends in a great semicircle to the Danube again at Orsova, where the defile called the **Iron Gate** separates the Carpathians from the northern spurs of the Balkans. The south-eastern portion of the range is also known as the **Transylvanian** Alps.

The northern Carpathians are separated from the Sudetes by the low gap called the **Moravian Gate**, which affords an easy passage from the March, a tributary of the Danube, to the valleys of the Oder and Vistula. This gap is defended on the east by the strong fortress of **Cracow**, near which are the famous salt mines of **Wieliczka**.

The Carpathians are thickly **forested**, only the highest summits (the High Tatra in the north, 8,700 feet) being above the tree-line. On the outer side of the semicircle the mountains descend somewhat abruptly to the plain, but on the inner side there are numerous minor ridges and peaks, and most of the Hungarian province of Transylvania is mountainous.

The **Austrian Alps** are more complicated in structure than the Western and Central Alps. They consist of a Central Zone of gneiss and granite, running east from the **Brenner Pass**, and culminating in **Gross Glockner** (12,500 feet). This range is known as the **Tauern** Chain, and is flanked north and south by limestone ridges, separated by longitudinal valleys.

At the northern foot of the Central Zone run the **Inn**, below Innsbrück, the Salzach, and the Enns. These three rivers, the upper courses of which are nearly in a continuous straight line, all make a sharp turn to the north, cut transverse gorges through the limestone ridge, and join the Danube.

South of the Tauern Chain the river **Mur** also flows longitudinally at first and then turns sharply to the south and flows transversely into the **Drave**, which lies in a parallel valley south of the Carinthian Alps.

Towards the south-east the **Carnic, Julian**, and **Dinaric** Alps are roughly parallel with the Adriatic coast. The last two ranges are connected by a remarkable limestone plateau called the **Karst**, which includes most of the peninsula of Istria.

The few short rivers of the Karst region mostly disappear underground in fissures or **pot-holes**, sometimes reappearing at a lower level. There are immense caves, and the limestone has weathered into fantastic peaks. Hollows are sometimes filled with lakes for several years, and then the water disappears and the bed of the lake can be cultivated.

Scenery of the Karst type is found in many limestone tablelands in different parts of the world, *e.g.* in part of the Central Plateau of France, in the Peak district of Derbyshire, and round the source of the Aire in Yorkshire.

III. RIVERS OF CENTRAL EUROPE.

300. The **Garonne** (350 miles) rises in the Pyrenees near their highest point, Maladetta, and runs north-west into the long estuary called the Gironde, where it is joined by the Dordogne, running due west from the Auvergne Mountains. The Garonne is navigable by small vessels to **Toulouse**, 270 miles from its mouth, and from there the **Canal du Midi** runs eastward to **Cette**, connecting the Bay of Biscay with the Mediterranean. Nearly the whole basin of the Garonne is a **vine-growing** district, **claret** being the principal wine produced.

The basin of the **Charente**, north of the Gironde estuary, is famous for its brandy (cognac), distilled from grapes.

The **Loire** (570 miles) is the largest river which is wholly French. It rises in the Cevennes, and flows nearly due north in a high valley between the Cevennes and Auvergne, reaching the lowland at **Nevers**. It turns westward at **Orleans** and flows into the Bay of Biscay. Its chief tributaries, the Allier, Cher, and Vienne, are all on the left, and rise in the Central Plateau, which is deeply penetrated by the Allier, running parallel to the upper Loire.

The **Canal du Centre** joins the Loire to the Saône at **Châlons-sur-Saône**, passing over a ridge about 1,000 feet high. The Loire is also connected with tributaries of the Seine by canals from Nevers and Orleans. The basin of the Loire includes some of the most fertile land in France, especially in the old province of **Touraine**, west of Orleans, which is known as the "Garden of France."

The **Seine** (480 miles) rises in the Côte d'Or, and flows north-west in an extremely sinuous course to the English Channel. Its largest tributary, the **Marne**, from the Plateau of Langres, joins the Seine just above **Paris**, and the **Oise**, from the west of the Ardennes, flows in just below Paris. The middle valleys of the Marne and Seine comprise the province of **Champagne**, world-famous for its wine.

The Marne above **Châlons** is connected with the Rhine at Strassburg by the **Marne and Rhine Canal**, which also links up the Meuse and Moselle. The Yonne, a southern left-bank tributary of the Seine, is connected with the Saône by the **Burgundy Canal** through **Dijon.** The Oise is connected by way of the Sambre with the Meuse and also with the Scheldt, so that there is water communication from Paris through industrial north-east France to the Low Countries.

301. The **Rhone-Saône** valley is the only route northward from the Mediterranean that is without serious natural obstacles, and it has been important from the earliest times. The **Rhone** (490 miles) rises in the Rhone Glacier near the St. Gothard, and flows west between the Bernese and Pennine Alps to Lake Geneva, where it deposits nearly all its sediment. Emerging from the lake at **Geneva** as a remarkably clear blue rapid stream, it flows south-west to **Lyons**, where it receives the slow muddy **Saône** (283 miles), from the Faucilles Mountains, a western spur of the Vosges. The chief tributary of the Saône is the **Doubs**, which flows north-east along the northern foot of the Jura, and then exactly reverses its direction, and runs south-west into the Saône above Châlons.

The valley of the Doubs is only separated from that of the Rhine, just below Basel, by a low waterparting called the **Burgundy Gate**, which is crossed by the **Rhone and Rhine Canal**. The Burgundy Gate is defended on the French side by the fortress of **Belfort**, backed by **Besançon**; and these are faced on the German side by **Neu Breisach**, backed by **Strassburg**.

The basin of the Saône is the ancient Duchy of **Burgundy**, famous for its wine. The grapes are grown principally on the eastern slopes of the Côte d'Or.

The lower Rhone valley is narrow for some distance below Lyons, but expands seaward into the plains of **Languedoc** and **Provence**, at the foot of the Cevennes and the Alps respectively. The river is too rapid for easy navigation, the delta at its mouth is marshy, and the channels are much impeded by sandbanks.

302. The **Rhine** (760 miles) is commercially, politically, and historically, perhaps the most important river in Europe.

It is the only river which cuts right across the Central Highlands from south to north, and so joins the North Sea to the narrowest part of the Alps, where the mountains can be crossed by single passes (St. Gothard and Splügen) into the Mediterranean basin.

The Rhine is formed near **Coire** (Chur) by the confluence of the **Vorder** Rhein and the **Hinter** Rhein. It forms part of the eastern frontier of Switzerland as far as Lake Constance. At **Schaffhausen**, a few miles below the lake, the river falls 60 feet over a ledge of rock, and there are rapids below the falls. At **Basel** the river turns at a right angle and enters German territory.

The plain of the middle Rhine, between the Vosges and Schwarzwald, is one of the most fertile and richly cultivated regions in Europe. The chief tributaries in this part of the river are the **Neckar**, from the Swabian Jura, and the **Main**, from the Franconian Jura and Fichtelgebirge. Both flow through richly wooded valleys, and float much **timber** down to the main stream.

At **Bingen**, a little below the confluence of the Main, the Rhine enters its picturesque gorge, and becomes the Rhine of the tourist. About halfway through the gorge, it receives the **Lahn** on the right bank and the **Moselle** on the left. The Moselle rises on the western slope of the Vosges, and its fertile valley forms another easy route between France and Germany, guarded by the great fortress of **Metz** in German Lorraine, and by **Nancy** and **Toul** on the French side.

At **Bonn** the Rhine enters the German Plain, and then flows north-west into Holland, entering the sea through a low delta (largely below sea-level) which is continuous with the deltas of the Meuse (Maas) and Scheldt.

The Rhine is a great commercial highway from the sea to **Mannheim**, at the confluence of the Neckar, which can be reached by vessels of 1,500 tons, while vessels of about half that size can ascend as far as **Strassburg** (on the Ill).

303. The **Meuse** (500 miles) rises in the Plateau of Langres and flows into the Low Countries through a wooded gorge in the Ardennes. Its lower course is parallel and near to that of the Rhine, and the two rivers are indistinguishable at their mouths. The chief tributary of the Meuse is the **Sambre**.

The **Scheldt** (250 miles) is entirely a lowland river, rising in north-east France, and flowing through western Belgium into the North Sea past the islands of Zealand.

304. The **Danube** (1,700 miles) is the great European highway from west to east, as the Rhine is from south to north. Though it is chiefly fed from the Alps and the Carpathians, the Danube rises in the south of the Schwarzwald, only a few miles from the Rhine valley. It runs E.N.E. to **Regensburg** (Ratisbon), and then turns towards the south-east between the Böhmerwald and the Bavarian Plateau. The chief Bavarian tributaries are the **Isar** and the **Inn**. Just below the confluence of the latter, the valley is constricted to a gorge at the **Austrian Gate**, between the Böhmerwald and the Alpine Foreland.

The valley then widens out into the **Austrian Plain**, which is again narrowed at **Pressburg** (the **Hungarian Gate**) by the near approach of the Little Carpathians. Beyond this the Danube flows east and then south across the great Plain of Hungary, receiving the **Drave** and the **Save** from the Eastern Alps, and the **Theiss** (the largest tributary) from the central Carpathians.

Through the **Iron Gate** at the end of the Carpathians the river enters the Wallachian Plain, and forms the boundary between Rumania and Bulgaria. It makes a sharp turn to the north and then again to the east, and enters the Black Sea through a swampy delta with three principal mouths. Just above the head of the delta the Danube receives its last tributaries, the **Sereth** and **Pruth**, from the eastern slope of the Carpathians.

The Danube was formerly obstructed by **rapids** at the Iron Gate, but the channel there has been deepened to 10 feet, and the entire river is navigable by steamers up to **Regensburg**, and by small vessels to **Ulm**.

IV. CLIMATE AND VEGETATION.

305. On the coast plain of the west the climate is on the whole similar to that of southern Britain, but in summer reaps the advantage of a lower latitude, and the French Plain is one of the great **wheat-growing** districts of Europe. France is also the greatest **wine**-producing country in the world, the area under vines being nearly as large as Wales (about 7,000 square miles); but its wheat-fields cover four times as great an area as its vineyards. The wheat is almost wholly consumed within the country.

As we go further east, the climate becomes more and more **continental**. On the Hungarian Plain the average temperature of January is about 30°, and that of July about 75°. As the rain falls chiefly during the hot summer, nearly the whole of central Europe, except the higher mountains, is a **productive** region, most crops being little affected by severe winters.

The chief vine-growing districts in France (Champagne, Burgundy, the Garonne basin) have been already mentioned. In Germany the vine is only grown extensively in the **middle Rhine** valley, and in the tributary valleys of the **Neckar** and the **Moselle**. The same region produces also wheat, fruit, and tobacco. **Hops** are an important crop in Bavaria, and **sugar-beet** is largely grown in Bohemia and northern Austria.

In Hungary the district round Tokay, on the river Theiss, is celebrated for its **wine**; but the Hungarian Plain, one of the most productive areas in Europe, is chiefly devoted to cereals, especially **wheat.** Hungary is the greatest grain-exporting country in Europe, after Russia. The wheat is to a large extent ground in the country, and exported as flour, which is unsurpassed in quality.

In the valley of the Rhone below Lyons the cultivation of **silkworms** on mulberry trees is a staple occupation, and in the extreme south of the Rhone valley there are extensive plantations of **olives.**

V. MINERALS.

306. The chief coal-fields of central Europe are (1) the **Franco-Belgian** coal-field, lying chiefly along the valleys of the Meuse and Sambre, and extending from **Aachen** (Aix-la-Chapelle) through **Liège** and **Namur** to **Valenciennes**, just within the French border; (2) three small coal-fields lying on the east side of the central Plateau of France, round **Creuzot**, **St. Etienne**, and Alais; (3) the **Saarbrücken** coal-field (in Germany), on the Saar, a southern tributary of the Moselle; (4) the **Ruhr** coal-field (also in Germany), between Dortmund and Essen, on the River Ruhr, a right-bank tributary of the Rhine; (5) the **Bohemian** coal-fields, west of Prague.

The **Saxon** and **Silesian** coal-fields have been already mentioned (Chap. XI.). There are large deposits of an inferior kind of coal (lignite) in several parts of the Austrian Alps, especially near **Gräz**.

Iron ores are found (1) on the Belgian coal-field, between **Liège** and **Namur**; (2) further south in the Duchy of **Luxemburg** (a country nominally independent, but economically part of Germany), and round **Nancy**; (3) south of the Ruhr coal-field, in the basin of the **Lahn**; (4) on the **Bohemian** coal-field; (5) near **Eisenerz** in Styria, between the rivers Enns and Mur.

The inner side of the Carpathians, in **Transylvania**, is rich in salt and gold; mercury is found at **Idria**, in the Julian Alps; copper, silver, and lead are mined in the **Harz** Mountains.

VI. TOWNS AND INDUSTRIES OF CENTRAL EUROPE.

Towns of France and Belgium.

307. Bordeaux, near the head of the Gironde estuary, is the largest town on the Bay of Biscay, and the chief port for French wines. Its outport for very large shipping is **Pauillac**, about 30 miles lower down the estuary. **Nantes** is the commercial centre and port of the fertile

Loire basin. Its trade formerly suffered much through the silting up of the Loire, which contributed to the growth of **St. Nazaire**, at the mouth of the river; but Nantes has recovered its position as a port by constructing a ship-canal.

Paris, the capital of France and the largest city of continental Europe (about three million inhabitants), was originally built on an island in the Seine, but has spread far out on both sides of the river. Its position just below the confluence of the Marne with the Seine, and halfway between the highlands and the sea, makes Paris the natural geographical centre of all northern France. The city has many industries, especially those producing articles of **luxury** and **fashion**. The suburb of **Sèvres** is famous for **porcelain**. The Seine has been so far deepened that Paris is becoming a considerable port.

The chief port of northern France, however, is **Le Havre**, on the north side of the Seine estuary. It has a large trade with North and South America in **cotton**, wheat, tobacco, wool, etc., and has daily steamers to Southampton.

Dieppe, Boulogne, Calais, Ostend, Flushing (Vlissingen), and the **Hook of Holland** are all packet stations connected with the English ports from Newhaven to Harwich. Dieppe, Boulogne, and Ostend are also popular watering-places.

308. The north-east corner of France and the north of Belgium form a busy manufacturing district with many large towns, whose varied industries are based chiefly on the Belgian coal-field and the iron of Luxemburg and the Moselle valley. **Textile** manufactures are especially important; local wool and local flax are used, but are insufficient for the requirements. Russian flax, United States cotton, and Argentine wool are all largely imported.

The chief centres of **cotton** manufacture are **Rouen** and **Ghent**. The former, owing to the deepening of the Seine, can now be reached by large ships, and Ghent has also recently been made a seaport by a ship-canal from the mouth of the Scheldt.

Woollen manufacture is carried on principally at **Roubaix, Amiens**, and **Reims**. The last of these is also one of the chief centres of the champagne trade, which is the staple business of **Epernay**, a few miles further south. **Lille** is an important frontier fortress, manufactures cotton, and is the chief centre of linen manufacture, which is also carried on at **Tournai**, **Courtrai**, and other places in the neighbourhood.

Liège, situated on the Meuse near where it leaves the highlands, and at a point where several tributary valleys converge, is near the centre of the coal-field, and has important **iron** manufactures, especially of fire-arms. **Brussels**, situated almost exactly in the centre of the lowland part of Belgium, is the seat of government and a large residential town, with varied industries, including **lace** manufacture.

If we omit the Ardennes provinces of Belgium, where there is only a small population, but include the Nord Department of France, there is a density of population throughout Belgium and north-eastern France of over 800 per square mile—a density only exceeded by Lancashire among the larger English counties.

309. Antwerp, just above the head of the Scheldt estuary, is in almost exactly the same latitude as London, and closely corresponds with London in the advantages of its geographical position. Antwerp has, however, the further advantage of a very complete and efficient canal system inland, and its traffic by canal is almost as great as that by sea.

Dunkirk, the only French port on the North Sea, is growing in importance on account of its deep, readily accessible harbour, and its proximity to the ring of industrial towns round Lille.

310. Lyons, at the junction of the Rhone and Saône, is the natural centre of the Rhone valley, and the chief silk-manufacturing town in the world. The raw silk is partly grown lower down the Rhone valley, where there are many ancient Roman towns of great historic interest. **St. Etienne**, in the Loire valley, on the small coal-field south-west of Lyons, manufactures fire-arms and silk ribbons.

Dijon, on a small tributary of the Saône, is a centre of the trade in Burgundy wine, and also an important route-town, where railways converge from the west and north, and diverge eastward into Switzerland and southward to the Mediterranean.

Marseilles, situated to the east of the Rhone delta, has been an important seaport for about 25 centuries. It is now the second town in France and the largest seaport of the whole Mediterranean. Its prosperity was greatly increased by the opening of the Suez Canal, which placed it on the highway to the East from north-western Europe. Many passengers cross France by rail and take steamer at Marseilles instead of making the long voyage round Gibraltar. **Toulon**, about 20 miles east of Marseilles, is the Mediterranean base of the French navy and the chief naval arsenal.

Towns of the Rhine Basin and Holland.

311. Rotterdam, on the river Lek, which is now the principal mouth of the Rhine, is the natural seaport of the whole Rhine basin, and one of the most rapidly growing of European ports. Its communication with the sea has been improved by a canal called the " new waterway " to the **Hook of Holland**, north of the river. **Amsterdam**, though the largest town in Holland, is not so favourably situated as Rotterdam, as it faces the shallow Zuyder Zee. A ship-canal, however, joins it across the isthmus of North Holland to the North Sea port of **Ijmuiden**. **The Hague** is only of importance as the seat of government in Holland, and a large residential city.

Above the ports at the mouth there is no great density of population in the Rhine valley until the Ruhr coal-field is reached, where there is a cluster of large industrial towns. On the north of the coal-field are **Dortmund**, a mining and smelting town, and **Essen**, with the great Krupp steel works; on the south are **Elberfeld** and **Barmen**, with great manufactures of textile fabrics, chiefly wool and silk; and the smaller towns of **Solingen** and **Remscheid**, making cutlery and steel weapons. On the other side of the river lies **Krefeld**, the greatest centre of silk manufacture in Germany. These towns, with their river-ports of **Düsseldorf** and **Duisburg**, have an aggregate population of over 1,500,000.

Further up the river, **Cologne** (**Köln**), noted for its cathedral and for the manufacture of perfume, is also an important river-port, situated at the crossing of the great river highway by the main railway line from Holland through Berlin to Russia. **Coblenz** (= *confluence*) is a strong fortress defending the Rhine valley from attack by way of the Moselle. **Strassburg**, on the Ill, just above its confluence with the Rhine, is also a strong fortress and an important route-town, at the junction of the Marne and Rhine Canal with the Rhone and Rhine Canal. **Mühlhausen**, in the extreme south of Alsace, is a centre of cotton manufacture.

Of the towns on tributaries of the Rhine the most important are **Frankfurt-am-Main**; **Stuttgart** on the Neckar, capital of the kingdom of Württemberg; and **Nürnberg** (§ 312). Frankfurt, which was formerly one of the chief financial centres of Europe, is important from its position, where the most direct route from the upper Rhine to the northern plain crosses the east and west route of the Main valley.

Towns of the Danube Basin and Bohemia.

312. **Ulm**, on the upper Danube, opposite a gap in the Swabian Jura leading to the Neckar valley (the only railway route across this range for more than forty miles); **Augsburg**, on the Lech; **Nürnberg** (in the Rhine basin), on the direct northward route from Augsburg; **Regensburg** (**Ratisbon**), at the most northerly point on the Danube; and **Passau**, at the junction of the Inn with the main river, were all, in mediaeval times, important route-towns and commercial centres for trade between northern Germany and Italy. They are now, however, comparatively small towns, except Nürnberg, which has large manufactures of artistic wood and metal work.

Munich (**München**), centrally situated on the Bavarian Plateau, is now the third largest town in Germany, but only became important during the nineteenth century, owing largely to its selection as the capital of the kingdom of Bavaria. It is the greatest brewing town in the world, and a centre of art and art industries. It is also an important corn mart.

Vienna, the capital of Austria, occupies a commanding position, as a route-town, at the intersection of the great highway of the Danube with natural routes (1) north-eastward to Russia through the Moravian Gate; (2) northward through Bohemia and the Elbe gap to Germany; (3) by way of the Inn over the Brenner Pass to the Adige and northern Italy; (4) south-westward to the head of the Adriatic by the Semmering Pass, Gräz, and Laibach. Vienna has large manufactures of machinery, silks, and furniture.

Buda-Pest, the capital and largest town of Hungary, is situated on the Danube just below the point where the river turns southward. Buda is situated on hills on the right bank of the river, and Pest on the plain on the left bank. The chief industry is flour-milling.

Prague is centrally situated in the Bohemian basin, on the navigable Moldau. Bohemia, possessing both coal and iron, is one of the most densely populated parts of the Austro-Hungarian Empire, and has varied manufactures, including all kinds of textile fabrics. The country is famous for its glass and porcelain, made chiefly in the west, near the Böhmerwald, where suitable sand and clay are found, and the forest supplies both fuel and potash. **Pilsen**, to the south-west of Prague, is noted for its beer.

Trieste and **Fiume**, the only two seaports of Austria-Hungary, both have excellent deep harbours, but their development is hampered by the barrenness of the immediate hinterland, and the distance from the chief centres of industry. Hungarian flour and timber are chiefly exported from Fiume, while Trieste has a general trade with the East, similar to that of Marseilles, but on a much smaller scale. **Pola**, at the south of the peninsula of Istria, is the Austrian naval station.

Belgrade and the towns of the lower Danube will be considered in connexion with the Balkan Peninsula (Chapter XIII.).

CHAPTER XIII.

SOUTHERN EUROPE.

I. THE IBERIAN PENINSULA.

General.

313. The Peninsula is in shape an irregular pentagon, with the longest side on the north and the shortest on the south-west, between Capes St. Vincent and Tarifa. On the only land boundary the Peninsula is sharply defined by the Pyrenees, which separate it from France.

The total **area** is nearly twice that of the British Isles; about one-sixth of the area is occupied by the Kingdom of **Portugal**, and the remainder by the Kingdom of **Spain**.

The coast consists mostly of high straight cliffs; there are no large indentations and few small ones, except in the north-west, where there are numerous rias. The only large estuary is that of the Tagus.

Configuration.

314. The Peninsula consists essentially of a plateau called the **Meseta**, filling nearly all Spain, and two folded mountain ranges—the **Pyrenean-Cantabrian** system on the north and the **Sierra Nevada** on the south.

The Meseta is separated from the northern ranges by the **Ebro** valley (the Plain of Aragon) and from the southern ranges by the valley of the **Guadalquivir** (the Plain of Andalusia). Between these two lowlands the average height of the plateau is over 2,500 feet. There is a gentle slope towards the west, so that the principal rivers flow to the Atlantic, the Peninsula thus, so to speak, turning its back to the Mediterranean.

Across the centre of the Meseta runs a ridge in an E.N.E. direction, which is known in various parts as the **Sierra d'Estrella, Sierra de Gata, Sierra de Gredos**, and **Sierra de Guadarrama**. This ridge, rising in some points to about 8,000 feet, and dividing the parallel valleys of the **Douro** and **Tagus**, was also the boundary between the old kingdoms of Leon and Old Castile on the north, and the provinces of Estremadura and New Castile on the south.

South of the Tagus is another parallel ridge, of which the central part is called the **Mountains of Toledo.** The steep southern edge of the Meseta, dividing New Castile from Andalusia, is known as the **Sierra Morena.**

On the south-west the Meseta sinks gradually to the lowland of **Alemtejo**, occupying the southern half of Portugal, between the lower Tagus and the Mountains of **Algarve**. There are narrow coast plains on the west between Lisbon and Oporto and on the east in Murcia and Valencia. These, with the valleys of the Ebro and Guadalquivir, are the only lowlands in the Peninsula.

315. The **Pyrenees** consist of a series of ridges running east and west from the Mediterranean to the Atlantic. The highest points are **Maladetta** and **Mont Perdu**, both over 11,000 feet high. The lower slopes are forested, and there is also much pasture. Some of the **cirques** or amphitheatres at the heads of lateral valleys are remarkable for their grandeur.

As a barrier to communications the Pyrenees surpass the Alps. No railways and only two or three carriage roads cross the mountains, which approach the sea so closely at both ends that even the railways which creep along the coast have had to tunnel part of their way. The easiest passes are the Col de Perche (5,000 feet) in the east, leading to Toulouse, and the Col de Roncesvalles (3,600 feet) in the west, leading from Pamplona into the Adour valley.

The Pyrenees are remarkable among great mountain ranges in the fact that they give rise to no river of the first importance. On the northern slope are only the **Adour, Garonne**, and Aude ; on the south the Ter and the northern tributaries of the Ebro.

316. The **Cantabrian** Mountains are a western lower continuation of the Pyrenees, rising only to about 8,000 feet. Their highest summits are the **Picos de Europa** in Asturias. A depression between the Pyrenees and Cantabrian Mountains, south of San Sebastian, gives a passage into the Ebro valley for the western railway from France.

The **Andalusian Mountains** are a series of parallel ridges, extending from Gibraltar E.N.E. to Cape de la Nao, and continued in the partly submerged ridge of the **Balearic Islands**—Iviza, Majorca, and Minorca. The central and highest part of the system, the **Sierra Nevada** (= snow mountains), rises in Granada and Almeria almost straight from the sea to beyond the snow-line. Their highest summit, **Mulahaçen** (11,600 feet), which is also the highest in Europe outside the Alps, is only about 20 miles from the sea.

Rivers.

317. The rivers of the Meseta flow mostly in deep gorges; they are too rapid and too shallow for **navigation**, and too far below the general level to be useful for **irrigation**. Hence Spain is a country where communications are peculiarly difficult.

The deep valleys and the high intervening ridges are **obstacles** to transverse routes, and the rivers themselves are nearly useless as longitudinal routes. These facts help to account for the very backward economic condition of Spain, and also for the numerous civil wars which have retarded its development.

One consequence of the configuration is that the ports of the Peninsula, with the exception of Oporto and Lisbon, are not, as in most other countries, at the mouths of the larger rivers. The **Guadalquivir**, however, is navigable by vessels of 1,000 tons up to **Seville**; and in the dry south-eastern provinces the rivers are used to some extent for irrigation.

The **Minho** (200 miles), and its chief tributary the Sil, both rise in the west of the Cantabrian Mountains. The lower Minho is the northern frontier of Portugal. The

Douro (460 miles) flows nearly due west across the plateau of Old Castile and Leon into the Atlantic at Oporto.

The **Tagus** (510 miles), the longest river of the Peninsula, has a course across New Castile and Estremadura nearly parallel to that of the Douro. It enters the sea by a fine estuary which narrows at **Lisbon** to about one mile in width.

The upper **Guadiana** (450 miles) is parallel to the Tagus and Douro, but the river is diverted southward by a ridge to the west of **Badajoz**. Its lower course is in part the eastern frontier of Portugal. The **Guadalquivir** (290 miles) flows across the fertile Plain of Andalusia between the Sierra Morena and the Sierra Nevada, receiving many tributaries from both.

The only large Mediterranean river of Spain is the **Ebro** (420 miles), which rises in the Cantabrian Mountains and flows south-east in a nearly straight line across the Plain of Aragon, receiving tributaries from the Pyrenees and the northern Meseta. The lower Ebro cuts its way through the Catalonian Mountains in a narrow winding gorge, and, like most Mediterranean rivers, ends in a flat swampy delta.

Climate and Vegetation.

318. In spite of its position in the extreme south-west of Europe, the configuration of the Peninsula gives to a considerable part of it, *i.e.* the Central Plateau, a **continental climate** with extremes of temperature and a small rainfall—generally less than 20 inches a year. The summers of the Meseta are very hot, but in winter, skating is often possible at Madrid. **Wheat** and **wool** are the staple productions of the Meseta. Owing to the nearly rainless summer, there are very few woods.

The highlands of the north and west have a mild oceanic rainy climate, and **maize** is an important crop in their valleys. In all the south-eastern lowlands the climate is **sub-tropical**, and the rainfall is so small that agriculture is almost entirely dependent on **irrigation**, which has been very skilfully carried on for centuries. Owing to the prolonged heat of summer, several crops in a year can be raised on the same ground wherever water can be got.

Oranges, **raisins**, olives, and cane-sugar are largely produced in Malaga, Granada, and Almeria; in Murcia even dates ripen. **Silk** is important in Alicante and Valencia. **Alfa**, or esparto grass, used for making paper, is almost the only vegetation of the drier steppes where water is not available.

Catalonia and southern Portugal contain large forests of **cork-oak** trees. **Oranges** and maize are the principal crops of central Portugal. The **vine** is largely distributed throughout the Peninsula. It is grown most extensively in the Ebro basin; round the lower Guadalquivir (sherry is so named from the town of Jerez); and round the lower Douro (port, named from Oporto).

Minerals.

319. Spain is richly endowed with many minerals, of which **iron** is most important. It is widely distributed, but is chiefly mined in the Basque provinces of the north, and in Murcia, being exported (principally to England) from **Bilbao**, **San Sebastian**, **Santander**, and **Cartagena**.

Copper is found in enormous quantities in the mines of the **Rio Tinto** in western Andalusia, and is exported from **Huelva**. **Mercury** is found on the northern slope of the Sierra Morena at **Almaden**, and **lead** on the southern slope of the same range at **Linares**. The chief **coal-fields** are in Asturias, and are connected with the port of **Gijon**.

Salt is produced from sea water by evaporation in many of the bays of the south; the bay-salt of **Setubal**, south of Lisbon, has a special reputation. Rock salt is abundant in Catalonia.

Distribution of Population.

320. The **population** of the Peninsula is little more than half that of the United Kingdom, though the area is nearly twice as great. Many of the inland provinces have less than 50 inhabitants to the square mile, and are comparable in density of population with the Scotch Highlands. The coast provinces are more densely inhabited, especially Barcelona, Biscay (Vizcaya), the coast strip from Valencia to Cadiz, and the lower valleys of the Douro and Tagus.

Towns.

321. Except Madrid and Seville all the large towns of the Peninsula are on or close to the sea. **Madrid**, on a tributary of the Tagus, has become a large town merely from its central position on the plateau where many routes joining the marginal towns intersect. **Valladolid,** in Old Castile, is the natural centre of the Douro basin, and is an important wheat market. **Toledo,** on the Tagus, south of Madrid, though now a small town, was once the capital of Castile, and has been famous for centuries for its manufacture of swords.

The inland towns of Andalusia—**Cordoba**, **Granada**, **Seville**—are chiefly of interest for their splendid monuments dating from the days of Moorish ascendency in Spain; but Seville is also a seaport and an industrial town. Andalusia is famous for its horses and bulls, trained for the national sport of bull-fighting.

Barcelona, the largest town in Spain after Madrid, is the chief seaport, and the chief manufacturing centre, cotton spinning being the staple industry. The fact that there is no port at the mouth of the Ebro is due to the difficulties of navigation of the lower part of that river; but Barcelona is in easy communication with the upper Ebro through **Lerida**.

On the west of the Peninsula are the two important ports of Lisbon and Oporto. The staple business of **Oporto,** which is not accessible to the largest ships, is the trade in port wine. **Lisbon**, the capital of Portugal, on a fine capacious harbour at the mouth of the Tagus, is an important port of call and the centre of one of the most productive parts of the Peninsula.

Cadiz, a fortified naval harbour near the mouth of the Guadalquivir, is the chief seaport of Andalusia, and has a great trade in wine.

322. **Gibraltar**, a **British** Crown colony, is situated at the eastern entrance of the Strait of Gibraltar, exactly opposite the Spanish fortress of Ceuta, in northern Africa. Gibraltar is a rocky headland about half a mile wide and four miles long, and over 1,400 feet high at the summit. The town and harbour are on the western side, facing the Spanish forts of **Algeciras**. The harbour has recently been greatly extended and improved, and Gibraltar is now the chief base of the British Atlantic Fleet. It is also an important coaling port.

II. THE PLAIN OF LOMBARDY, PIEDMONT, AND THE RIVIERA.

323. The **Plain of Lombardy** includes the most important part of northern Italy. Though named after one province, it includes the greater part of the provinces of Piedmont, Lombardy, Venetia, and Emilia. It is bounded on the south by the Apennines, on the west and north by the Alps, and on the east by the Adriatic Sea.

The plain is a deep **depression** once occupied by an arm of the Adriatic, but now filled up with a great depth of alluvial soil brought down from the Alps and Apennines.

The filling up of the Adriatic is still in active progress. Adria, Ravenna, and Rimini, which were all seaports in Roman times, are now inland towns, Adria being about 20 miles, and Ravenna 4 miles, from the sea.

The Alpine lakes of Italy—**Maggiore** (150 sq. miles), **Lugano, Como** (65 sq. miles), Iseo, and **Garda** (180 sq. miles) —are situated where lateral valleys of the Alps open out to the plain. They are great tourist resorts, and also serve as reservoirs regulating the flow of the tributaries of the Po, which would otherwise be subject to disastrous floods.

The plain is drained longitudinally by the River **Po**, which rises on Monte Viso in the Cottian Alps, and flows north-eastward to Turin, whence its course is nearly due east to the rapidly advancing delta. Owing to the fact that the Alpine tributaries have a greater volume and more rapid current than those from the Apennines, the course of the main river has been pushed somewhat to the south of the centre of the plain.

On account of the immense amount of sediment washed down, the lower course of the river is above the general level of the plain, and has to be embanked. This fact of course makes it easy to use the water for irrigation, and this is extensively done.

The only other large river of the Adriatic is the **Adige**, called in Austria the Etsch. It rises in the west of the Tyrol and flows nearly due south through a deep valley to Verona, and then eastward nearly parallel to the Po. The Adige valley is an important route, as one of its higher tributaries leads up to the Brenner Pass, the easiest to cross of all the Alpine passes.

Climate and Productions.

324. The Plain of Lombardy has a mild moderately rainy climate, being sheltered on the north by the great wall of the Alps, while the lower Apennines on the south intercept part of the Mediterranean water vapour, and prevent the plain from being too rainy. The winter, however, is rather cold, and frost and snow are not uncommon. Owing to the great depth of alluvial soil, and the abundance of rivers and irrigation canals, the plain is very fertile. Grass crops are usually reaped four times a year, and in some parts more often.

The products of the plain are very varied, perhaps the most important being **silk**. The mulberry trees on which the silkworms feed are also used as supports for **vines**. The northern part of the plain is the only part of Europe in which **rice** is extensively cultivated. **Wheat, maize,** hemp, and other sub-tropical plants are also grown. The rich meadows support many cattle, and from their milk two famous kinds of cheese are made—Gorgonzola and Parmesan.

Population and Towns.

325. The plain has on the average about 400 inhabitants to the square mile; there are very few agricultural regions in the world, and none in Europe, which support a denser population.

Milan, the largest inland town in Italy, owes its importance to its central position on the plain at the meeting-point of several routes from Alpine passes (§ 129). It has great silk manufactures.

Turin is also an important route-town, on the Mont Cenis road to Italy (§ 128). It manufactures silk and wool.

Venice, situated on a number of islands in a lagoon guarded from the sea by sandbanks and from the land by marshes, is now but a shadow of its former greatness.

It was a great sea-power in the Middle Ages, with possessions in Dalmatia and Greece, and a very lucrative trade with the Levant and the further East. It is still a considerable port, not only for the eastern part of the plain, but to some extent for western Austria, via the Brenner route.

326. Bologna, famous for its sausages, stands on the southern edge of the plain, at the place where the railway from the east coast (running nearly in a straight line from Rimini to Milan) crosses the northward route from Florence through the Apennines by the River Reno. **Piacenza** and **Cremona** are old bridge-towns on the Po.

The forts of **Verona, Legnano, Peschiera**, and **Mantua**—the first two on the Adige, the last two on the Mincio—are famous in military history as the Austrian Quadrilateral. Only Verona and Mantua have modern fortifications.

The Plain of Lombardy is one of the classic **battlegrounds** of European history, the other being the plain of the Low Countries. In both cases there are no obstacles, except rivers, to the movements of armies. The Plain of Lombardy is especially easy to defend, on account of the number of parallel rivers crossing it transversely. Hence all the fortresses are at river crossings.

The Riviera.

327. This name is given to that part of the Mediterranean coast, partly French and partly Italian, which is sheltered on the north by the Maritime Alps and the Ligurian Apennines, and therefore enjoys specially mild winters. It is a region of great beauty, and contains a series of fashionable pleasure-towns, of which **Nice** is the largest.

The only town of economic importance is the old seaport of **Genoa**, which has an illustrious history, and was for many years the rival of Venice as a sea-power. After falling into comparative decay, Genoa was revived by the opening of the Alpine tunnels, which brought southern Germany into its hinterland, and made it the chief seaport of Italy, measured by the tonnage of ships entering its harbour.

The mountains behind Genoa have a greater rainfall than any other part of Italy.

III. PENINSULAR ITALY AND SICILY.

The Apennines.

328. The whole length of peninsular Italy and Sicily is occupied by the limestone ranges of the **Apennines**. From Liguria in the north the mountains run diagonally across the peninsula, reaching the east coast near **Ancona**, and leaving on the west the lowlands of Tuscany and Latium (the modern province of Rome).

The mountains are highest in the province of the Abruzzi, where the **Gran Sasso d'Italia** rises nearly to 10,000 feet in **Monte Corno**. On the west of the central Apennines are a series of **lakes**—Trasimeno, Bolsena, Bracciano, Albano—occupying the craters of recent volcanoes; and further south the still active cone of **Vesuvius** rises over 3,000 feet on the shore of the Bay of Naples.

The southern Apennines again cross the country diagonally towards the western side, filling up the peninsula of Calabria, and leaving the lowland of Apulia on the east. The range is continued westward along the north of Sicily, culminating in the active volcano of **Etna**, nearly 11,000 feet high. A **submarine ridge** connects the mountains of Sicily with those of Tunis. Southern Sicily is comparatively low.

Rivers.

329. Italy resembles Spain in the fact that its **rivers** are unimportant for navigation, and that the chief ports are not at the mouths of the rivers, which are, however, as already noted, valuable for **irrigation**.

The only considerable rivers of peninsular Italy are the **Arno** and the **Tiber**, which rise close together in the Etruscan Apennines. The Arno (150 miles) flows west through Tuscany, the ancient Etruria. It is only navigable by small boats. The Tiber (210 miles) flows south through the hilly province of Umbria and the flat marshy Roman **Campagna**. Small steamers can ascend as far as Rome.

Climate and Productions.

330. In regard to temperature, peninsular Italy is very similar to southern Spain, but has a considerably greater rainfall, owing to the absence of any high plateau in the interior, and to the fact that no part of Italy is more than about 60 miles from the sea. As usual in Mediterranean countries the rainfall diminishes towards the south, and is so much confined to the winter months that during the hot summers irrigation has to be practised on a large scale.

The one great climatic disadvantage of Italy is the prevalence of **malaria** in large areas of the lowlands, which are almost uninhabitable on that account. The worst districts are the **Pontine Marshes**, south of Rome; the **Campagna**, north of Rome; and the **Maremma** of northern Tuscany; but there are very few districts entirely free from malaria. Steps are, however, being taken to drain the malarial swamps, and to diminish the mosquitoes, which are the chief, if not the sole, carriers of the disease.

In places where water can be got during the nearly rainless summer, crops can be grown at any time of the year, and several times a year. Many of the mountain slopes, up to about 3,000 feet, have been skilfully terraced, and grow **olives** and **vines**. The higher slopes are bare or covered with poor pasture for sheep. Wheat and maize are grown in the lowlands, especially near Naples and in Sicily, the north of which also grows many **oranges** and **lemons**. The **wheat** of Apulia is specially hard, and is used for making macaroni. Figs and almonds are grown in Calabria, the **vine** and **olive** almost everywhere.

The **forests** of Italy, covering about one-seventh of the area, consist chiefly of evergreen oak and pine, beech, and chestnut.

Minerals.

331. Italy is comparatively poor in minerals, differing markedly in this respect from Spain. The most important mineral is **sulphur**, produced by the eruptions of Etna and found both in mines and as a surface deposit on and near the volcano. **Iron ore** is of no importance on the mainland, but is mined in **Elba** and **Sardinia**. The marble quarries of **Carrara** and **Massa**, on the northern border of Tuscany, are celebrated. In the volcanic district of southern Tuscany certain hot springs and lagoons deposit large quantities of boracic acid.

Towns.

332. Florence (Firenze) is on the border line between the Tuscan hills and the plain of the Arno, at a point from which there is an easy route through the Apennines by the Reno valley to Bologna and the northern plain. Its brilliant history, beautiful surroundings, and great art collections have made Florence one of the chief "show" cities of the world. The once important port of **Pisa** has been reduced to insignificance by the silting up of the mouth of the Arno, and **Leghorn (Livorno)**, celebrated for straw-plaiting, is the port of central Italy.

Rome owes its enduring importance more to historical and religious causes than to any special geographical advantages, though its very central position both in Italy and in the whole Mediterranean basin should be noted. It was originally founded as a **bridge-town** on the Tiber, controlling routes north and south between the mountains and the sea. The position of Rome as the metropolis of Catholic Christendom is a direct consequence of its earlier position as the temporal ruler of the world. The ancient seaport of **Ostia**, at the mouth of the Tiber, has no modern importance.

Naples (Napoli) has grown into the largest town in Italy owing to its possession of one of the best climates in Europe, and to the extraordinary fertility of the surrounding plain. It is the chief seaport of southern Italy, and the magnificent scenery of the bay, with **Vesuvius** and the ruins of **Pompeii** and **Herculaneum** close at hand, has made the city a favourite winter resort.

Brindisi, on the coast of Apulia, is of importance only as being the Italian port nearest to the Suez Canal. Hence it is the point of embarkation for the mails and passengers (in a hurry) for the East. They reach Brindisi by the east coast railway from Bologna, where the lines from Milan and from the Brenner route unite.

Sicily.

333. This large island is the most densely populated part of Italy, except the northern plain and the Neapolitan Campania. It contains three large towns, all seaports. **Palermo**, on the north coast, exports wheat, oranges, and other fruit. Its harbour is diminishing in size, owing to a rising of the coast. **Messina** is a fortified harbour commanding the strait of the same name. **Catania,** at the southern foot of Etna, is the chief place of export of Sicilian sulphur. The small port of **Marsala**, in the extreme west of Sicily, is famous for its wine.

NOTE.—The Italian seaports have one characteristic in common—that their **imports** are much **greater** than their **exports**. This is due to the fact that the leading imports (coal, iron, machinery, timber, raw cotton) are heavy, bulky articles, which come chiefly from the British Isles and from America. The leading exports, on the other hand (silk, manufactured cotton, eggs, wine, olive oil, etc.), are mostly of high value in proportion to their bulk, and go for the most part by rail to the countries of central Europe.

IV. THE BALKAN PENINSULA.

334. The **Balkan Peninsula** is defined physically on the north by the courses of the Save and the lower Danube, but for political and historical reasons Rumania, which lies mostly north of the river, and physically belongs partly to the Carpathian foreland and partly to the Russian plain, is generally included in the Balkan States.

These states are: (*a*) in the north **Bosnia-Herzegovina** (administered by Austria) and the kingdoms of **Servia** and **Rumania**; (*b*) in the centre the principalities of **Montenegro** and **Bulgaria** (the latter nominally under Turkey, but virtually independent), and the European part of the **Turkish Empire**; (*c*) in the south the kingdom of **Greece**.

Coasts and Configuration.

335. The Black Sea coast is for the most part low and straight. An unhealthy marshy region, called the **Dobruja**, extends from the Danube delta to Varna. The Adriatic coast is mountainous and highly indented, with numerous peninsulas and islands mostly lying parallel to the coast—the remnants of a folded mountain range which has been partially submerged.

The coast of Greece is one of the most highly indented in the world, and contains many fine natural harbours. The **Peloponnesus** (Morea) is almost cut off from the mainland by the **Gulfs** of **Corinth** and **Aegina**, between which the narrow **Isthmus of Corinth** has been pierced by a ship-canal, which is not commercially very important on account of the rapid currents which flow through it.

The core of the Balkan Peninsula is a very irregular highland region culminating in the **Rhodope** Mountains, which form part of the boundary between Macedonia and Bulgaria, and rise in **Rilo Dagh** nearly to 10,000 feet. The whole of the central part of the peninsula is a wild region of detached mountain groups separated by small, fertile, but isolated plains. The highlands are flanked on the west and on the north-east by folded mountain ranges.

On the north-east the **Balkan** range begins at the Danube just south of Orsova, and sweeps in a wide curve, first south and then east, nearly to the Black Sea, shutting in the lower Danube valley. The eastern part of the range is the boundary between **Bulgaria** and **Eastern Rumelia**, which are now, however, under one government. The range is only crossed by one railway, that from Sofia to Plevna, which follows the gorge of the River **Isker**. Another railway is projected across the **Shipka Pass** (4,000 feet) near the middle of the range.

On the western side of the peninsula the **Dinaric Mountains**, continuous with the Dinaric Alps of Dalmatia, run south-east and then south along the coast in several parallel limestone ridges, some of them 6,000 feet high. The few short rivers flow in wild almost impassable ravines, communications are specially difficult, and a great part of the Dinaric region is of the barren Karst type (§ 299). Thus while peninsular Italy and the Iberian Peninsula for the most part face the west, the Balkan Peninsula turns its back on the Adriatic, and faces east and south towards Asia.

Routes and Rivers.

336. The chief eastern route of the peninsula is the lower Danube, from Belgrade to the mouth. **Galatz**, at the confluence of the Sereth, and **Braila**, a few miles higher up, are the ports of the Danube.

The **Sulina** mouth of the river is that chiefly used for navigation. The Rumanian bank of the Danube is low and marshy, while the right bank is high, so that most of the towns on the lower Danube are on the Bulgarian side.

The most important southern tributary of the lower Danube is the **Morava**, the basin of which is almost identical with the kingdom of Servia. An upper right bank tributary of the Morava, the **Nishava**, is only separated by a low pass (2,400 feet) from the upper valley of the **Maritsa**, which flows first east through Eastern Rumelia, and then south through the plain of Adrianople to the Aegean Sea.

The diagonal **Morava-Maritsa line** is the most important route in the whole peninsula, and is followed by the **Orient express** from Belgrade to Constantinople.

The River **Vardar**, flowing south into the Gulf of Salonica, is another important north to south route, joined by railway, over a pass only 1,700 feet high, to the Morava valley.

Apart from the towns of the northern plain and Athens in the south, the only considerable towns of the Balkan Peninsula are situated on the two routes, diverging at Nish, from Belgrade to Constantinople and to Salonica.

Climate and Productions.

337. North of the Balkans the climate is of the continental character common in central Europe, and the productions are similar to those of the adjoining parts of Hungary and Russia.

The southern valleys have naturally a milder climate, but, owing to their eastern position, the climate is more extreme than that of other Mediterranean countries.

The Adriatic coast has a **heavy rainfall** (60 to 80 inches), diminishing towards the south and east. The driest parts are in the neighbourhood of Salonica and Athens.

So much of the area is mountainous that the Balkan Peninsula as a whole is not a productive region, though it might become much more so if it were governed with any degree of intelligence.

The lowlands on both sides of the Balkans are very fertile, and produce much **maize** and **wheat**. These crops are also largely grown in the valleys of the Austrian province of **Bosnia**, where agriculture has greatly improved under the stimulus of the security afforded by the only reasonably efficient government in the peninsula.

In the south the chief agricultural products are fruits, especially **grapes**, **plums** (dried and exported as prunes), and **currants**—small seedless grapes which form the principal export of **Greece**. They grow best in a very limited area round the Gulf of Corinth (whence the name currant is derived).

Olives are grown in the valleys everywhere, and form an important part of the food of the people. Sheep feed on the mountain pastures. The perfume called **attar of roses** is made from the product of many rose gardens in the sheltered valleys just south of the Balkans.

Minerals.

338. Greece exports considerable quantities of iron ore from **Laurion**, south of Athens, and from the island of **Seriphos**, in the west of the Archipelago. Elsewhere difficulties of communication and the generally undeveloped state of the country have hindered the working of minerals, though many are known to exist.

Silver, lead, and **mercury** are worked to some extent in northern Servia, and that country also contains coal in the Morava valley and further east. In northern Rumania, on the southern face of the Carpathians, there is a rather important production of **petroleum**.

Population.

339. The Balkan Peninsula is still a theatre of conflicting religions and races—Slavs, Turks, Greeks, Albanians, Jews, Armenians, and others—and their fanatical hatreds have prevented both political unity and economic development, while the constant unrest, varying from war down to mere brigandage, provides the jealous powers of Europe with the perennial "**Eastern Question**,"—the question as to which of them is ultimately to obtain control of Constantinople when the Turkish power falls.

The present states have been carved out of the **Turkish Empire**, essentially an Asiatic power, whose European possessions have constantly shrunk since the seventeenth century, and now consist only of **Thrace, Macedonia**, and **Albania**, in all of which Turks are a minority of the population. The most densely peopled of the Balkan States is **Servia**, and even there the inhabitants number less than 150 to the square mile.

TOWNS.

340. Constantinople, the capital of the Turkish Empire, has a position marked out by nature in the clearest way as the site for an important town. It stands at the south end of the **Bosphorus** on a peninsula between the sea of Marmora and the magnificent natural harbour called the Golden Horn. It is thus a ferry-town (the Bosphorus is only about a mile wide), connecting two continents, and also a strait-town, commanding the waterway between the Black Sea and the Mediterranean.

The railway in course of construction from **Scutari**, on the other side of the Bosphorus, through Asia Minor to the Persian Gulf, should add to the importance of Constantinople as a route-town.

Constantinople serves to a considerable extent as an entrepôt for the commerce of Asiatic Turkey, nearly all its exports coming from Asia. The Balkan Peninsula itself is more conveniently served by **Salonica**, on the Aegean Sea, the port of Macedonia and the Vardar valley; **Piraeus**, the port of Athens; **Patras**, on the Gulf of Corinth, the chief place of export of currants; **Varna**, on the Black Sea, the port of Bulgaria; and the Danube ports. **Kustenji** or **Constantsa**, on the Black Sea south of the Danube, is a modern port of growing importance: connected by rail with Belgrade through Bukarest, and with Constantinople by steamer, it offers an easy route to the latter town as an alternative to the Maritsa route.

The chief inland towns of the peninsula are **Adrianople** in Thrace, **Philippopolis** in Eastern Rumelia, **Sofia**, the capital of Bulgaria (all three on the railway to Constantinople); **Athens**, the capital of Greece, of more historical than modern importance; **Bukarest**, the capital of Rumania, centrally situated on the Wallachian Plain; and **Belgrade**, at the junction of the Save and the Danube, the capital of Servia and an important river-port.

V. ISLANDS OF THE MEDITERRANEAN.

341. The **Balearic** Isles are a province of Spain and together have an area about equal to the county of Norfolk. The largest town is **Palma**, on Majorca. Oranges and olives are largely grown, and the islands are a centre of fisheries (tunny and sardines).

The mountainous islands of **Corsica** (French) and **Sardinia** (Italian) almost divide the western Mediterranean into two parts. Their combined area is about equal to that of the six northern counties of England, but the population is only about one million.

Sardinia contains much **mineral** wealth, especially **lead**, **silver**, and **zinc**, but the mines are very little worked, and both islands are economically in a very backward state. Wheat and wine are produced, and there are fine **forests** of chestnut and pine. The capitals—**Ajaccio** in Corsica and **Cagliari** in Sardinia—are only of local importance. The small island of **Elba**, to the east of Corsica, contains the chief iron ores of Italy.

Sicily has already been dealt with (see §§ 328, 333).

342. The small, but densely inhabited islands of **Malta** and Gozo (area 115 square miles; population about 200,000), south of Sicily, are a **British** colony with partially representative government. The islands are fertile and highly cultivated.

Their chief importance, however, is as a **port of call** and **coaling station**—about 4,000 vessels a year enter the harbour of Valetta—and above all as a strongly **fortified base** for the British Mediterranean fleet, on the direct line between Gibraltar and the Suez Canal, and almost exactly half way between them. The capital, **Valetta**, is on the east side of Malta, on a small peninsula with nearly landlocked harbours on both sides of it.

The **Lipari** Islands, north of Sicily, are a group of small volcanic cones, **Stromboli**, the most northern one, being almost continuously active. **Pumice-stone** is the only important product.

The **Ionian Islands**, of which the largest are Corfu, Cephalonia, and Zante, lie near the east coast of Greece and Albania. They are mountainous, but have fertile slopes and coast plains, producing wine, olives, and **currants**. The only town of any size is **Corfu**, which is becoming a favourite winter resort.

The **Grecian Archipelago** consists of a great number of islands in the Aegean Sea, divided into two groups—

Euboea and the **Sporades** in the north, and the **Cyclades** in the south. The islands are on the whole less fertile than the Ionian Islands, and are of little modern importance, but many of them are very picturesque and of great archaeological and historical interest.

Santorini, in the south of the Cyclades, is the only example in Europe of a volcano the crater of which has been invaded by the sea; the present island is merely the rim of the old crater, with two wide gaps in it. **Hermopolis**, on the island of **Syra** in the centre of the Cyclades, is the chief commercial centre of the Archipelago.

Crete, south of the Archipelago, is a long narrow island with a ridge of mountains running through its whole length from west to east. The area is about the same as that of Corsica. The chief productions are **olives**, **raisins**, and **wine**. The only manufacture is that of **soap**, made from olive oil. Like the Ionian Islands, Crete was for several centuries a possession of the Venetian Republic. It then became Turkish, but has recently been made a separate state under a governor appointed by the Powers of Europe. The chief towns are **Canea**, the capital, and **Candia**, both on the north coast, conveniently situated for trade with Greece and Turkey.

Cyprus, which is geographically part of Asia, is the third largest island in the Mediterranean, and is a **British** colony with partly elective government. Its productions are entirely **agricultural**—wheat, barley, olives, cotton, and wine. The chief towns are **Nicosia**, the capital, near the centre of the island, and the small ports of **Larnaka** and **Limasol**, on the south coast.

CHAPTER XIV.

NORTH AMERICA (GENERAL), WEST INDIES, CENTRAL AMERICA, MEXICO.

General.

343. The **area** of North America is about eight million square miles, or more than twice the area of Europe. The average elevation, 1,900 feet, is almost exactly twice that of Europe. The central line of the continent is approximately on the meridian of 100° W., and the length is about 4,000 miles. The greatest width, between Labrador and British Columbia, is about 3,000 miles, and the continent tapers gradually to the Isthmus of Panama, 45 miles wide.

The north coast, about Lat. 70° N., is fringed by a large but useless **archipelago**, connected with the mainland every winter by ice. The "north-west passage" through the archipelago and **Bering Strait** to Asia is occasionally practicable in summer, but is of no commercial value.

Another large archipelago, the **West Indies**, lies off the south-east of the continent at the entrance of the Gulf of Mexico. The only other large islands are **Vancouver Island** and **Newfoundland**, on opposite sides of the continent in about Lat. 49° N.

Coasts.

344. The coasts of North America are of very varied character, the differences being chiefly due to movements of elevation and depression. On the east coast, north of New York, the land has been **depressed** in comparatively recent times; hence the coast is rugged, irregular, and highly indented. New York Harbour, Boston Harbour, the Bay of Fundy, the mouth of the St. Lawrence, and Hudson Bay are **drowned valleys**, and the coasts of Maine, Nova Scotia, Labrador, and Greenland are deeply intersected with **fjords**.

From New York southwards, along the whole Atlantic coast, and round the north of the Gulf of Mexico, there is a flat coast plain, narrow in the north and wide in the south, due to a recent uplift of the sea-floor.

The plain is in many parts swampy and unfit for cultivation, though towards the south it produces great crops of **rice**, **tobacco**, and **cotton**. It is bordered for long distances by sand-bars and chains of low sandy islands, enclosing shallow lagoons. There are no good natural harbours, except in the north, where a slight local depression has enabled the sea to overflow the lower valleys of the Delaware, Chesapeake, and Potomac, forming long inlets, the first two of which have important ports at their heads (Philadelphia and Baltimore).

The west coast, from Vancouver Island northward, has the same **fjord** structure as the corresponding part of the east coast, and is the result of a similar depression.

Southward, from about 48° N., the coast is rising, and, being the edge of the main mountain axis of America, is for the most part straight and steep, with hardly any large openings, and very few safe harbours. The Bay of San Francisco, as the only gap in a long stretch of mountainous coast, has become the site of the chief port in Western America.

The long narrow Gulf of California is a **trough** between two mountain ranges, and is slowly being filled up by the silt of the Colorado River.

On the west side North America descends abruptly into deep water, but on the Atlantic coast and in the Gulf of Mexico the 100 fathom line is at a considerable distance from the shore (often more than 100 miles), and the whole of Hudson Bay is shallow.

Land Relief.

345. There are two great mountain systems in North America—the **Rocky Mountains** in the west, from Alaska to Mexico, and the **Appalachian Mountains** in the east, from Newfoundland and Nova Scotia to the edge of the coast plain in Alabama.

A third important watershed is a low ancient **plateau** extending east and west, north of the St. Lawrence and the Great Lakes. The eastern part of this is known as the **Laurentian Highlands**, and the western part as the "**Height of Land**"—a very slight elevation north of Lake Superior.

Just south of this lake, in Wisconsin and Minnesota, are rugged **uplands** which were once connected with the Laurentian Mountains.

346. The **Rocky Mountains**, strictly speaking, form only the high eastern edge of an extensive **plateau**, which at its widest, about Lat. 40° N., stretches across about one-third of the continent. In this middle portion there are four distinct parallel ranges, with high plains between them:—(1) the **Rocky** Mountains (which extend from Alaska to the Rio Grande), (2) the **Wasatch Mountains**, (3) the **Sierra Nevada**, (4) the low **Coast Range**.

Between (2) and (3) is the extensive plateau known as the **Great Basin**. It is mainly a region of inland drainage, with the **Great Salt Lake** on its eastern edge.

On the north and south respectively of the Great Basin lie the **Columbia Plateau** and the **Colorado Plateau**, so named from the rivers, which in the very dry climate of this part of the continent have cut down their beds almost vertically, forming deep wild **cañons** on a very grand scale.

Between the Sierra Nevada and the Californian coast range is the important low **Californian Valley**, draining into San Francisco Harbour by the rivers Joaquin and **Sacramento**. North of the Columbia River the coast ranges are known as the **Cascade Mountains**, and further north still as the **Alaska Range**. This contains the highest mountain in North America, Mount McKinley (over 20,000 feet), and the volcanic peak of Mount St. Elias (18,000 feet).

The Rocky Mountains proper seldom exceed 13,000 feet, and the coast ranges are lower. Mount Columbia (over 13,000 feet) is the highest in the Canadian section, and Pike's Peak (over 14,000 feet), in Colorado, the highest in the United States. In the Sierra Nevada Mount Whitney is nearly 15,000 feet high. The Cascade Mountains contain many extinct volcanoes.

347. In the south the Rocky Mountain system is continuous with the **Mexican Plateau**, which fills nearly the whole width of the narrowing continent, descending steeply on both sides to a narrow plain.

In the south of the plateau is a line of active or dormant **volcanoes**, stretching almost from sea to sea westward of Vera Cruz. The chief cones, from east to west, are **Orizaba** (18,000 feet), **Popocatepetl** (17,500 feet), and Colima, near the Pacific; the last is the most active.

The Mexican Plateau sinks in the south to the low **Isthmus of Tehuantepec**, which separates it from the **Cordilleras** of Central America. This isthmus has recently become an important transcontinental route, by the construction of a railway from Coatzacoalcos southwards to Salina Cruz.

348. Central America, from Tehuantepec to Panama, is mainly occupied by a series of ranges running approximately east and west. There are many **volcanoes** on the Pacific side. A depression between two of the ranges is occupied by Lakes Managua and Nicaragua and the San Juan River. Proposals were made for the construction of a ship-canal along this route to connect the two oceans, but the idea was abandoned in favour of the Panama route (§ 369).

The peninsula of Yucatan is a low plateau, geographically part of Central America, but politically in Mexico.

349. The **Appalachian** Mountains are lower and less extensive than the Rockies, though in the early days of colonisation they were a formidable barrier to westward expansion. In the north are several distinct ranges—the **White Mountains** of New Hampshire, the **Green Mountains** of Vermont, the **Adirondack** and **Catskill Mountains** of New York.

The middle part, in Pennsylvania and Virginia, is known as the **Alleghany Mountains**. It consists of a series of parallel even ridges, from north-east to south-west, with broad fertile valleys between. Narrow transverse valleys have been cut through the ridges by the rivers Delaware, Susquehanna, and Potomac, and are important lines of communication. Most of the hills are forested to the top.

In North Carolina the **Blue Ridge** contains the highest points of the Appalachian system, Mount Mitchell and Black Dome (nearly 7,000 feet).

On the east the Appalachians slope down to the coast plain through the **Piedmont Plateau**. Where the rivers break through the eastern edge, their courses are interrupted by falls or rapids. Hence the edge of the plateau, called the **Fall Line**, marks the limit of navigation, and becomes a site of ports and manufacturing towns making use of water-power. Philadelphia, Baltimore, Washington, and Richmond are all on or near the Fall Line.

On the west the mountains slope gradually to the great central plain through the **Alleghany Plateau**, the most important part of which is in western Pennsylvania, round the head waters of the Ohio.

The Central Plain.

350. Vast **plains** occupy the middle of North America from the Arctic Ocean to the Gulf of Mexico. There is no interruption of the monotonous level except in some isolated groups of no great height, *e.g.* the Black Hills of South Dakota and the Ozark Mountains in Indian Territory. The chief **watershed** of the plains is a low ridge north of the Missouri, separating the drainage of Hudson Bay from that of the Gulf of Mexico.

The lowest and flattest parts of the plain are round Hudson Bay and the lower Mississippi. The middle part is mostly over 600 feet above sea-level. Its eastern portion, from the Alleghany Plateau and the Great Lakes to about 100° W., is known as the **Prairies**. The prairies merge without any definite line of demarcation into the "**Great Plains**," which are less uniform in level, and rise very gradually to about 4,000 feet at the foot of the Rockies.

Lakes.

351. The **lakes** of North America form perhaps the most remarkable physical feature of the continent. They occupy shallow depressions of the plains, formed by the great ice-sheet which once covered almost all the continent from the middle Mississippi northwards. This ice-sheet, when it finally melted, covered the prairies, south and west of the present lakes, with a deep layer of glacial drift or silt, now forming a marvellously fertile soil.

The larger lakes lie along a curved line, convex towards the west, extending from Lake Ontario to Great Bear Lake on the Arctic Circle. Besides about ten large lakes there are thousands of smaller ones, many of which would be called large in any other part of the world.

By far the most important of the lakes are the five "**Great Lakes**," which drain into the St. Lawrence River, and are said to contain half the fresh water in the world. The largest, Lake **Superior**, is bigger than Scotland; the smallest, Lake **Ontario**, is bigger than the largest lake in Europe. With the aid of a few short canals these lakes provide a system of inland navigation unequalled in any other continent.

The passage between Lakes Superior and **Huron, at Sault Ste. Marie**, is obstructed by rapids, but two ship-canals have been cut here, one in the United States and the other on the Canadian side. So great is the lake commerce that the tonnage of ships passing through these canals is much greater than that passing through the Suez Canal.

Between Lakes **Erie** and **Ontario** the Niagara River carries the whole outflow of the four upper lakes over the magnificent **Niagara Falls**, 160 feet high. The falls are now becoming of economic importance as a source of power. For navigation they have been avoided by the cutting of the **Welland Canal**, west of the river. Of these lakes **Michigan** alone is wholly within the United States.

RIVERS.

I. Arctic and Hudson Bay Drainage.

352. The greatest river of the north is the **Mackenzie** (2,500 miles), which takes the outflow from Lake Athabasca, Great Slave Lake, and Great Bear Lake—the three largest of the northern lakes. The Mackenzie, with its chief tributary, the Athabasca, is one of the great rivers of the world in volume and length, but is commercially useless on account of the rigorous climate of the greater part of its basin, and the inaccessibility of its mouth, even in summer.

A large number of rivers flow from all sides into the large inland sea of Hudson Bay. The most important is the **Nelson-Saskatchewan** (1,900 miles), bearing the latter name in its upper course from the main chain of the Rockies to Lake Winnipeg, and the former name below the lake. The **Red River of the North** (600 miles) also flows into Lake Winnipeg, and thence to Hudson Bay, though its source is only a few miles from that of the Mississippi.

II. Atlantic Drainage.

353. By far the most important North American river flowing directly into the Atlantic is the **St. Lawrence** (2,000 miles), which with the Great Lakes provides a **navigable waterway** for large ships into the heart of the continent. The river flows into a long deep estuary almost landlocked by Newfoundland and Cape Breton Island. The chief tributary is the **Ottawa**, on the left bank.

On the right bank of the St. Lawrence, a little below Montreal, the short **Richelieu** River flows in from Lake Champlain, which is connected by canal with the Hudson River.

Proposals have been made to deepen the Ottawa and connect it by canal, through Lake Nipissing, with Georgian Bay in Lake Huron, in order to provide a shorter waterway nearly due west from Montreal to Lake Superior.

354. The chief Atlantic rivers of the United States are:—

Connecticut,	Susquehanna,
Hudson,	Potomac,
Delaware,	James.

The **Hudson** (325 miles) is navigable by large ships to Albany, which is connected northward with Lake Champlain and the St. Lawrence, and westward by the Mohawk River and the **Erie Canal** with **Buffalo** on Lake Erie.

The **Susquehanna** and **Potomac**, both flowing into Chesapeake Bay, penetrate further into the Appalachian Mountains than the other rivers, and their valleys have been of importance in facilitating the spread of population westward to the Alleghany Plateau and the prairies.

III. Gulf Drainage.

355. The **Mississippi** is the greatest river of North America and one of the greatest in the world. Including the **Missouri**, which is longer than the main river, the length is about 4,200 miles, and the area of the basin about 1¼ million square miles, more than one-third of the area of the United States.

The Mississippi rises in **Lake Itasca** near the head of Lake Superior. Its course is obstructed by falls and rapids as far as the **Falls of St. Anthony**, which supply power for the great flour-milling industry of **Minneapolis** and **St. Paul**, "twin-cities" on opposite sides of the river. From St. Paul to the Gulf of Mexico the river is **navigable** by fair-sized steamers.

The chief right-bank tributary is the **Missouri**, nearly 3,000 miles long, and draining half a million square miles. It is navigable up to the **Great Falls** in Montana, where it cuts through the eastern rim of the Rockies. The **Yellowstone**, **Platte**, and **Kansas** Rivers are the chief affluents of the Missouri.

Round the upper waters of the Yellowstone River an area of five thousand square miles has been preserved as a **National Park**, where the wild animals of this region (bison, bear, etc.), elsewhere almost exterminated, have a secure home. The Yellowstone Park is a region of recent volcanic activity and still has hot springs and geysers.

356. The **Arkansas** and the **Red River** are the chief right-bank tributaries of the Mississippi, south of the Missouri. All the western tributaries of the Mississippi are very muddy, and many of them are raising instead of lowering their beds. They are flooded in spring by the melting of Rocky Mountain snow, and are very low in autumn.

On the east of the Mississippi the **Ohio** is the largest and the only important tributary. It rises on the Alleghany Plateau not far from Lake Erie, and flows south-west and west across a rich prairie region, receiving the Tennessee just before its junction with the Mississippi. The river is **navigable** by barges up to **Pittsburg**. As the Ohio basin has a rather high rainfall, and there are no lakes to regulate the discharge, the river is subject to disastrous floods, rising occasionally as much as 60 feet.

The lower Ohio and lower Mississippi flow through a flat, swampy, thickly-wooded "**flood-plain**" some 30 miles wide, bordered by "bluffs" 200 or 300 feet high, on which the towns are built. The plain is being raised by sediment deposited during floods, and the river has to be confined by embankments called **levées**, but it has not so far been possible to limit it to one permanent channel. The river ends in a complicated **delta**, rapidly advancing into the Gulf, and shaped like the fingers of a hand—a marked contrast to the smooth convex outline of the typical delta.

The **Rio Grande** is the only other large river flowing into the Gulf. Its basin is very arid, and in its upper course the river flows through deep cañons. The lower course of the river is the frontier between the United States and Mexico.

IV. Pacific Drainage.

357. The largest Pacific river of America is the **Yukon**, which rises in the extreme north-west of Canada, on the east side of the St. Elias Range, and flows through Alaska into the Bering Sea. It is navigable during the few weeks when it is not frozen, and has become of some importance on account of the **gold-fields** situated round the confluence of the **Klondike River**, a small right-bank tributary.

The other important Pacific rivers are the Fraser (650 miles), Columbia, Sacramento, San Joaquin, and Colorado. It follows from the configuration of the continent that the western rivers (except the Yukon) are essentially mountain rivers, and are therefore relatively short, rapid, and of little use for navigation. The **Fraser** is amazingly rich in fish, especially salmon, which (tinned) form an important export of British Columbia. The **Sacramento** and **San Joaquin** are chiefly important for the irrigation of the Californian Valley.

The **Snake** River (the chief tributary of the Columbia) and the **Colorado** are famous for their cañons. The **Grand Cañon** of the Colorado is over 200 miles long, and in one place 6,000 feet deep, with almost vertical sides. Yet the Colorado is, geologically, a "young" river. Such rivers as this, instead of being aids to communication and travel, are almost impassable barriers.

The Gulf of California, into which the Colorado flows, once extended much further to the north-west; but the enormous deposits of silt brought down by the river gradually cut off the head of the Gulf. The cut-off part gradually dried, forming the "**Imperial Valley**," part of which is 300 feet below sea-level. A lake of variable area at its northern end, called the Salton Sink, was the remnant of the old Gulf.

Disastrous changes have recently taken place in this region. The Colorado River burst its embankments in 1905, once more filling up the Imperial Valley, destroying much irrigated farm land, and necessitating the removal of the Southern Pacific Railway to higher ground.

CLIMATE.

358. There are considerable general resemblances between the climates of North America and of Eurasia, the chief differences being caused by the much greater importance of the **monsoons** in Asia, and by the influence of the Mediterranean in southern Europe.

In both continents we find (1) a **very great range** of temperature inland, especially in the north, with summer rain (Siberia, Canada), (2) a very mild, **equable, rainy** north-west (British Isles, British Columbia), (3) a **hot,**

rainy south-east (Indo-China, the Gulf coast), (4) **arid deserts** in the south-west (Persia and Arabia, Arizona).

In both cases the climate with least variation is found in the tropical rainy south-eastern archipelago (East and West Indies).

The **winter isotherms** run roughly from west to east, with a slight convexity to the south. The West Indies and all Central America have an average January temperature over 70°. North of Lat. 40° N. the whole continent is below the freezing-point, except along the west coast, which is much warmer owing to the prevailing south-westerly winds and the surface drift of warm water across the Pacific. The influence of the west winds at this season extends as far south as California, which, like the Mediterranean countries, gets nearly all its rain in winter.

The **summer isotherms** are convex to the north, and are ranged round a pole of maximum heat (90°) in the south-western States and northern Mexico. Central America, the lower Mississippi, and the West Indies are now over 80°.

The **northern isotherm** of 80° runs in July nearly centrally through the United States from south-east to north-west, curving south again on approaching the cooler Pacific coast. Central Canada, which in January is 30° or more below the freezing-point, is in July warmer than the south of England.

The absence of any transverse mountain barrier, such as shields the south of Asia from the north, is a distinct disadvantage climatically (though it facilitates communications) to the southern States, which are exposed to cold northern winds, and occasionally suffer from severe frosts, even on the margin of the Gulf, and as far south as Florida.

Winds and Rainfall.

359. The widest part of North America is mostly in the northern belt of westerly winds. Hence the general movement of air over the continent is from west to east. On the Atlantic side the winds are much stronger in winter than in summer, owing to the fact that the intense cold of winter makes the continent a centre of high pressure, which reinforces the eastward current.

Central America and Mexico are in the belt of north-east trade-winds, which are strongest in summer, and produce the heaviest rainfall of the continent in the mountains between Tehuantepec and Panama. The whole of the Gulf coast is well watered, and in summer the low pressure over the land draws the moist trade-wind northwards from the Gulf far up the Mississippi valley, this effect being reversed in winter.

On the west of the continent the trade-winds are off-shore, and a region extending from the coast of California north-eastwards through the States of Arizona, Utah, and Nevada is almost completely rainless—partly because it is shut in by high mountains.

On the north-west, from about 45° N. to the Arctic Circle, there is a heavy rainfall all the year round on the narrow strip between the coast and the coast ranges, while in central California, as already mentioned, rain is almost confined to the winter months.

On the central plains rainfall diminishes uniformly from east to west, and occurs chiefly in the summer. Between 100° W. and the Rockies the climate is almost everywhere too dry for trees and for agriculture without irrigation.

The West Indies are subject to hurricanes in the summer and autumn. The storm centre usually follows a curved track north of, and parallel to, the larger islands and the east coast of Florida. Tornadoes, smaller in extent than hurricanes, but even more destructive, are not infrequent in the lower Mississippi valley.

THE WEST INDIES.

360. A **submarine ridge** runs from Honduras to Jamaica, and another, much wider, from Florida to Cuba. Near Haiti the two ridges converge into one, which is continued almost in a semicircle to the delta of the Orinoco. The West Indian Islands are the summits of these ridges.

The name West Indies perpetuates the belief of Columbus that he had arrived in Asia.

The four large islands of Cuba, Jamaica, Hispaniola, and Porto Rico are called the **Greater Antilles**. The **Lesser Antilles** extend from the Virgin Islands to Tobago. They are divided into two groups, the **Leeward Islands** (an inappropriate name, as they are fully exposed to the trade-winds) and the **Windward Islands.**

Another group, also called the Leeward Islands, belongs geographically to South America, and lies on the continental shelf off Venezuela. The most important of these is the Dutch island of **Curaçoa**, which gives its name to a famous liqueur.

The coral **Bahama** Islands lie north of the Greater Antilles, mostly just outside the tropic. With this exception all the West Indies lie between the tropic and 10° N. Their **climate** is uniformly hot (over 80° in summer, and 70° to 75° in winter); very rainy in summer, especially of course on the windward side, and fairly dry in winter. Most of the islands are healthy, and outbreaks of yellow fever, once the chief scourge of the West Indies, are becoming rare.

Except in **Cuba**, where the population is predominantly of Spanish descent, white men are everywhere in a minority, the great bulk of the people being negroes, descendants of slaves. The original inhabitants (Caribs) were almost exterminated in the early days of Spanish colonisation.

Political Divisions.

361. Cuba, a Spanish colony till 1898, is now a nominally independent republic, practically under the suzerainty of the United States, which in the same year annexed **Porto Rico**, previously Spanish. **Hispaniola**, the second largest island, is divided into the two negro republics of **Haiti** in the west (formerly French and still French-speaking), and **San Domingo** in the east (Spanish-speaking). There are hardly any white men in the island, which is virtually uncivilised.

Jamaica, the **Bahamas**, and most of the **Lesser Antilles**

are British, but France owns **Guadeloupe** and **Martinique**, and Denmark and Holland possess a few small islands east of Porto Rico.

Products.

362. Until recently the most important product of nearly all the islands was **cane-sugar**, which is still made on a large scale; but the industry was severely injured, first by the abolition of slavery, and then by the rise of the beet-sugar industry in Germany.

Many of the islands are now turning their attention to other products, especially **bananas** and other tropical fruits (oranges, pineapples, etc.), **coffee**, and cacao. Cuba has long been famous for its fine **tobacco**, Jamaica for **rum** (distilled from molasses and other sugar products), and Montserrat for **limes** (a species of lemon). Trinidad possesses a unique lake of pitch or asphalt, which is a valuable export. There is valuable **timber**—mahogany, cedar, and dyewoods—in Cuba and some of the other islands.

Configuration.

363. The **Greater Antilles** are all mountainous, the ranges running east and west in line with the greatest length of the islands. In Cuba the highest mountains are the **Sierra Maestra**, in the extreme south, parallel to the ridge of the **Blue Mountains** in Jamaica, 100 miles southwards.

The western end of Cuba is a low limestone plateau, similar to Yucatan. **Hispaniola** contains four distinct ranges, of which the highest, the **Ciabo Chain** (over 10,000 feet), is in line with the Sierra Maestra, while the southern range is a continuation of the Blue Mountains.

The **Bahamas** are low coral islands surrounded by innumerable reefs or "cays." **Watling** Island is supposed to be the land first sighted by Columbus in 1492. The islands are mostly rather barren, and the chief industries are **sponge-fishing**, and the preparation of "bay-salt" in natural lagoons and ponds.

The **Lesser Antilles** consist of a chain of **volcanic peaks**, with a line of lower islands, mostly coral, on the east. Several volcanoes are still active, and in 1902 there were disastrous eruptions of **Mont Pelée** in Martinique and of La Soufrière in St. Vincent. Some of the islands further north have been occasionally ruined by hurricanes. **St. Lucia** possesses a fine natural harbour, and has been fortified as a naval base. **Tobago** is the southernmost of the volcanic islands, and the real termination of the West Indies.

Trinidad is a detached part of South America, its northern hills being a continuation of the Venezuelan coast range, from which they are only separated by a strait about 10 miles wide. Trinidad is one of the most prosperous of the British West Indian islands, owing to the variety of its products and the fact that it is to some extent a trade centre for Venezuela. Its production of **cocoa** is large and increasing. The famous **Pitch Lake** of La Brea is in the south-west.

West Indian Towns.

364. Havana, the capital of Cuba, is the only large town in the whole archipelago. It lies at the narrow entrance of a large natural harbour on the north-west coast, nearly opposite the south of Florida. It is connected by rail with the fine harbour of **Santiago de Cuba**, in the south-east.

Kingston, the capital of Jamaica, is in the south of the island on a lagoon nearly enclosed by a sand-spit, at the end of which stood the old capital of Port Royal, now mostly submerged. The site has suffered severely from earthquakes. The growing fruit trade of Jamaica is chiefly carried on from **Port Antonio** on the north coast.

The Bermudas.

365. The British colony of the **Bermudas** is a small group of islands about 700 miles north-east of the Bahamas. They are wholly of **coral** formation, and are the most northerly coral islands in the world, the water, owing to the Gulf stream, being warmer around them than anywhere else in the same latitude.

The islands grow early vegetables for America, and owing to the excellent climate are a favourite winter resort. Being almost equidistant from the United States, Nova Scotia, and the West Indies, Bermuda is a position of great strategical importance, and has been described as the Malta of the Atlantic. It is a fortified **naval base**, and the strong garrison comprises more than one-quarter of the total population.

CENTRAL AMERICA.

General.

366. Politically, Central America contains six independent republics:—

Guatemala,	Honduras,	Costa Rica,
Salvador,	Nicaragua,	Panama,

and the Colony of **British Honduras**. As a geographical expression, Central America also includes Mexico as far as Tehuantepec.

The three largest of the Republics, **Nicaragua**, **Honduras**, and **Guatemala**, are each nearly as large as England; the smallest, **Salvador**, is about the size of Wales. Guatemala and Salvador are by far the most densely peopled, containing more than half the whole population, which amounts to about five million.

The great bulk of the population consists of Indians or half-breeds, pure whites (mainly Spanish) being everywhere in a minority.

The region as a whole is very mountainous, with many active volcanoes, some of which, on the Pacific coast of Guatemala, are over 13,000 feet in height. The main watershed is near the Pacific, and there is a wide coast plain on the Atlantic coast in Honduras and Nicaragua. Some of the rivers on this side are navigable by light steamers.

Malarial swamp and jungle cover most of the Atlantic slope, where the rain is heaviest; and therefore the greater part of the population is on the Pacific slope or in inland high valleys, which are both drier and cooler. The capitals of all the states are nearer the Pacific than the Atlantic, and all, except Panama, are high inland towns.

Productions.

367. **Mahogany** and other ornamental woods, **rubber**, **bananas**, and **cacao** are the chief products of the hot lowlands—the **tierra caliente** *—up to about 2,000 feet; **coffee** is the chief cultivated plant at a higher level in the **tierra templada** *; **grain** and **cattle** are produced on the cool uplands—the **tierra fria** *—over 6,000 feet. **Maize** and beans are the staple foods of the people. **Gold**, **silver**, and other metals are known to exist, but are at present hardly worked. The only products which enter largely into the commerce of the world are **coffee**, **bananas**, and **timber** (mahogany and dyewoods).

Towns.

368. The only large town of Central America is **Guatemala**, situated 5,000 feet above the sea in the midst of rich coffee plantations. It is connected by rail with **Puerto Barrios** on the Atlantic and **San José** on the Pacific. The other seats of Government are **Belize** (British Honduras), **San Salvador**, **Tegucigalpa**, **Managua** (Honduras), **San José** (Costa Rica), and **Panama**.

The Panama Canal.

369. The Isthmus of Panama has been traversed by rail, between Colon and Panama, since 1855. A **ship-canal** along the same route was begun under French auspices in 1881, but was soon abandoned. The United States has now undertaken the construction of the canal, and has leased from the republic of Panama a strip five miles wide on each side of the route. The canal will be 46 miles long, and will rise by a series of locks to a summit-level of about 250 feet.

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* These terms are used throughout Mexico, Central America, and northern South America, to denote the successive zones of climate and vegetation—hot, temperate, and cool—met with on mountain slopes.

The canal will bring the Pacific ports of both North and South America into closer connection with the Atlantic and Gulf ports and with Europe. From Liverpool to San Francisco the saving will be over 6,000 miles. The canal will be of great naval importance to the United States by enabling it rapidly to concentrate its fleets in either ocean.

From English ports to **New Zealand** the **Panama** route is about 1,300 miles shorter than the Suez route, and 3,000 miles shorter than the Cape route; but for Australia, China, and Japan the **Suez route** will still be shorter from Europe.

From **New York** to **Hong Kong** via Panama will, however be almost as short as from **London** to **Hong Kong** via Suez; and New York will be brought **nearer to Japan** by the new route than London is by the present route. Thus the canal will have the effect of placing the industrial part of the United States (the north-east) on an equality with England in regard to distance from the markets of the Far East.

For all Pacific ports north of the equator the Isthmus of **Tehuantepec** would afford a still shorter route from the North Atlantic, but the construction of a cana would be attended by far greater engineering difficulties.

MEXICO.

370. The federal republic of Mexico is the most northern part of what is sometimes called "**Latin America,**" which extends from the Rio Grande to Cape Horn, and derived its civilisation and its white inhabitants chiefly from Spain and Portugal, whereas the rest of the continent is predominantly English.

The great commercial, industrial, and political contrasts between Britain and Spain in Europe are mirrored, and even intensified, in the contrasts between English America and Latin America.

The commercial development of Latin America, which is now going on rapidly, has been so far principally due to the enterprise and capital of the people of Britain and the United States. The latter power exercises a real, though quite unofficial and unacknowledged, protectorate over the weak republics of Latin America, guarding them from the ambitions of European powers eager for expansion.

Configuration and Climate.

371. Mexico has an area about six times as great as the British Isles, and a population about one-third as great. Only about one-fifth of the people are pure white, the remainder being chiefly Indians or half-breeds.

The country is almost bisected by the tropic, but owing to the great elevation of the Mexican Plateau nearly all the interior has a **mild, temperate climate**, very dry in the north-west, which is continuous with the deserts of Arizona, and rainy in the narrower south and east, especially on the seaward margins of the plateau.

Owing to the configuration of the country, and in part to the dry climate of the interior, the rivers are of little importance for navigation, but their water-power at the edge of the plateau is being increasingly used for the growing cotton industry of the south.

Products.

372. Mexico exhibits the usual zones of vegetation from tropical to sub-arctic forests, but cultivation is as yet in a very primitive condition. The chief crops are **rice**, **sugar**, and **cotton** on the unhealthy coast lowlands; **maize** and **wheat** on the central plateau; and **henequen** (a kind of hemp) on the low limestone plateau of Yucatan. Henequen is one of the most important of the exports.

There are large numbers of cattle and sheep, much of the interior being too dry for agriculture.

Mexico is enormously rich in **metals**, and is one of the principal mining countries in the world. **Silver** and **copper** are at present by far the most important, followed by gold. There are silver mines in no less than twenty-four out of the thirty states of the republic. **San Luis**

Potosi, near the centre of the country, and **Monterey**, further north, are important mining centres with large smelting works.

Communications.

373. There are over 12,000 miles of **railway** open (half the mileage of the United Kingdom). The lines radiate inland from the Gulf ports of **Vera Cruz** and **Tampico**, and are connected northwards at several places with the Southern Pacific Railway of the United States.

Railway construction has been extremely difficult, as the lines from the coast have to rise several thousand feet on to the plateau, and even there the surface is by no means uniform. The line from Vera Cruz to Mexico rises over 8,000 feet before descending to the valley, about 7,000 feet high, in which the capital is situated; and north of Mexico the line climbs again to over 10,000 feet.

Towns.

374. Mexico, the capital and largest town, was founded in prehistoric times as an island city on Lake Tezcuco, in a high valley immediately to the north of the main volcanic range. The lake has much diminished in area, however, and is now some distance from the town. Mexico is one of the most purely Spanish cities in America.

Vera Cruz and **Tampico** are the chief ports of the country, both situated on harbours which have been artificially deepened and improved. Vera Cruz derives importance from its proximity to the capital, but Tampico is a better railway centre.

The Pacific port of **Acapulco**, on one of the finest natural harbours in the world, is as yet unimportant, because it has no railway connexions through the very mountainous country behind it. **Guaymas** is a rising port on the Gulf of California, in the neighbourhood of many mines, and is connected by rail with the United States.

CHAPTER XV.

THE UNITED STATES AND CANADA.

General.

375. The federal republic of the United States of America (U.S.A.), and the British self-governing colony of the Dominion of Canada, comprise more than **nine-tenths** of North America, each having an area nearly as large as that of Europe.

The unparalleled growth of the **United States** is one of the most important features of the world's history during the last half-century, and **Canada**, on a smaller scale, is now expanding in population and productiveness more rapidly than any other part of the British Empire.

The population of U.S.A. increased from about 5 million in 1800 to nearly 80 million in 1900, and during the same period the population of Canada grew from about 250,000 to over 5 million. The two countries together will soon have more than 100 million inhabitants, as both are receiving immigrants on a large scale—about one million a year enter the States alone.

Population.

376. The original **Red Indians** are now less than ½ per cent. of the population, and in many parts have quite disappeared. There are several million **negroes** or "coloured" people in the Southern States, where slavery existed till the Civil War of 1861-5, and where the acute racial hostility between whites and blacks is one of the chief problems of American politics. The other inhabitants are of **European** origin, chiefly, but by no means wholly, British.

Canada belonged to **France** till 1759, and the French race and language persist throughout a large part of eastern Canada, and predominate in Quebec and its neighbourhood.

The lower Mississippi basin was also **French** till its purchase by the States in 1803, and many of the Creoles of New Orleans are of French origin.

Florida and California were both acquired from **Spain,** and still contain people of Spanish blood, though these form a small minority.

Modern **immigrants** into the States come from all parts of Europe, but principally from the **British Isles** (especially Ireland) and from **Germany**. There are probably at least as many people of Irish birth or descent in U.S.A. as in Ireland itself. Immigrants into Canada come mainly from the **British Isles** and from **U.S.A.**

People of most diverse races and languages—always excepting the coloured people—seem to become rapidly "Americanised" in the States, and after one or two generations to be almost indistinguishable from the dominant race.

VEGETATION AND ANIMALS.

Forests.

377. The extreme north of Canada, with a wholly Arctic climate, consists of "**Barren Lands,**" or **tundras,** of no economic value. South of this a belt of **forest,** chiefly spruce, larch, and pine, extends E.S.E. across the continent from Alaska to the mouth of the St. Lawrence. This **sub-arctic** forest is continuous with the mixed **temperate forests** (oak, pine, maple, etc.) which surround the Great Lakes and originally filled nearly all eastern Canada and the New England states.

The **Appalachian** Mountains are mostly forested to the top, and there are large forests of yellow and white pine in the lower **Mississippi** valley and in Florida. West of about 95° W. the central **prairies,** owing to deficient rainfall, are nearly treeless as far as the base of the Rocky Mountains.

The **Rockies,** and still more the coast ranges, are densely forested, spruce, cedar, redwood, and Douglas fir being the principal trees. The trees of California and British Columbia are among the largest in the world.

The unrivalled facilities for inland navigation are of great importance to the enormous timber trade of North America, as timber is so bulky that it cannot be economically transported long distances by rail. The cold winters are also an advantage, as they provide hard roads of frozen snow, over which the timber is dragged on sledges to the nearest running water.

Agriculture and Pasture.

378. The central and northern prairies have become within the last half-century the greatest grain producing region in the world, owing to their fertile glacial soil, and also to the flatness of the surface, which facilitates both the construction of railways and the extensive use of agricultural machinery.

The **wheat belt** extends from about 40° to about 55° N., the most fertile part of it being the broad flat valley of the Red River, partly in **Manitoba** and partly in **North Dakota** and **Minnesota**.

Within certain limits a **high latitude** is favourable to the growth of wheat, on account of the greater length of daylight in summer, and the moisture produced by melting snow in spring; hence the yield per acre in Canada is greater than in the States, though up to the present the total production is not nearly so great.

379. South of the wheat belt lies the more extensive belt of **maize** (called "corn" in U.S.A.), which requires a longer and warmer summer than wheat. The maize belt occupies the middle States from **Nebraska** and **Kansas** to **Ohio**. While the product of the wheat belt is very largely exported, maize only forms a small export, being extensively used to feed cattle and swine, which, dead or alive, are one of the principal exports of the States.

To the south-east of the maize belt is the largest area of **tobacco** cultivation in the world, in Kentucky, Virginia, Maryland, and North Carolina.

The south-east Atlantic coast plain and the Gulf coast plain are the greatest **cotton**-growing district in the world, extending from **South Carolina** to **Texas**, and producing also **rice** and **sugar**, and (in **Florida**) **oranges**.

The best kinds of cotton are "**sea island**" cotton, grown in the small islands on the coast of Georgia (the Florida Keys), and "**upland**" cotton, grown in the interior of the cotton belt on higher ground.

West of the central prairies, as the rainfall decreases, the grain country gradually passes into **cattle pasture**, and this into still drier **sheep pasture**, till the Rocky Mountains are reached. The intermont basins are mostly quite unproductive in the absence of irrigation, which has been successfully carried out round Salt Lake City.

380. To sum up; we may say that as we go from north to south, say along the meridian of 90° W., the **succession** of **vegetation** would be (1) tundra, (2) forest, (3) wheat, (4) maize, (5) cotton, (6) rice and sugar. Going from east to west, say along Lat. 40° N., we should find (1) forest, (2) mixed farming (grain and cattle), (3) grain (maize), (4) pasture, (5) mountain forest, (6) desert, (7) mountain forest, with (8) wheat and fruit in the irrigated Californian Valley. There are, of course, no definite lines marking off the zones of vegetation, which in fact overlap to a considerable extent.

MINERALS.

Coal.

381. The most important coal-field in America, or indeed at present in the world, is the **Appalachian** coal-field, which extends from northern Pennsylvania to Alabama, a distance of 900 miles. The northern part of the coal-field is the most extensively worked, owing to the neighbourhood of great towns and industries. In the extreme north-east a small area contains valuable deposits of anthracite.

There are also large coal-fields on both sides of the **middle Mississippi**: (1) in **Illinois** and **Indiana**, (2) in **Iowa**, **Missouri**, and **Kansas**; and smaller fields are widely distributed in the Rockies and coast ranges.

The United States produce considerably more than one-third of the world's supply of coal. This is nearly all consumed within the country, but is partly exported to Canada, whose coal-fields, though large in extent, are not yet very largely worked, and are chiefly situated in the western mountains, far from the centres of industry. In eastern Canada the only coal-fields much worked are in the north of **Nova Scotia** and in **Cape Breton** Island.

Petroleum.

382. The north of the great Appalachian coal-field contains also the chief **petroleum** field in the world, a large oval area some 300 miles long and 100 miles wide, centred at **Pittsburg**, and roughly parallel to Lake Erie. Petroleum from the innumerable wells in this region is pumped directly through pipes into refineries situated in the North Atlantic ports or on the Lakes, whence the oils and their by-products are distributed all over the world.

The production of petroleum in Pennsylvania has passed the maximum and is slowly declining, but large quantities have been recently discovered in **Texas.** **Natural gas** occurs on most of the petroleum fields, and is largely used as an illuminant.

Iron.

383. Iron ore is widely distributed, being found in many of the States and in Canada, but the two most important districts in America are (1) the highlands to the **west** and **south** of **Lake Superior,** and (2) the southern Appalachians, in northern **Alabama**. In the first district there are five ranges of hills, all very rich in iron, grouped round the western end of the lake—the Vermilion, Mesabi, Gogebic, Menominee, and Marquette Ranges.

The ore of this region is remote from coal, but it has two great advantages: (1) to a large extent the ore can be quarried instead of mined; (2) it all lies within a few miles of Lake Superior, whence water transport is easy and cheap to the Lake Erie ports, for the great Pennsylvania manufacturing district, and the steamers bring back cargoes of coal for the Lake Superior region.

The district round **Birmingham** in Alabama has coal, iron ore, and limestone in close proximity, and can therefore produce pig and cast iron very cheaply, but the ore is not suitable for steel making.

British North America is rather poor in iron ore, the principal deposits so far known being on **Bell Island**, north-east of Newfoundland. The ore is carried to the steel works at **Sydney**, on the Cape Breton coal-field.

Other Metals.

384. Copper, gold, and silver are abundant and widely distributed in North America. **Copper** is found in a pure state in the Keweenaw Peninsula, projecting northwards into Lake Superior; but the ores of **Montana**, round Butte and Anaconda, are still more important. The same district also produces silver.

Gold is principally found in four parts of the western mountains: (1) **Colorado**, (2) **California**, (3) the **Klondike** district of the Yukon basin, centred round **Dawson City**, in Canada, close to the Alaskan frontier, (4) the **Kootenay** district, in the extreme south of **British Columbia**, where **Rossland** is the chief mining centre. The Kootenay district is also rich in silver and copper. The Colorado district of the Rocky Mountains also produces **silver**, and is the chief **lead** mining centre of U.S.A. **Quicksilver** is mined at New Almaden, in California.

The **Klondike** goldfields are only accessible (1) up the Yukon River, navigable only for a few weeks in summer, (2) from Skagway, at the head of the Lynn Canal, whence a short railway leads over the White Pass and down to a navigable tributary of the Yukon.

The "gold rush" to Klondike in 1897 caused a dispute between Britain and the United States about the interpretation of a vague treaty of 1825, concerning the southern frontier of Alaska, then Russian, but since purchased by U.S.A. An arbitration board in 1903 brought the Alaskan coast strip as far south as Prince of Wales Island, and thus deprived British Columbia of nearly half its coast line, including the Skagway route to Klondike.

RAILWAYS.

385. North America has now a vast railway system, considerably larger than that of all Europe, though the latter is so much more densely peopled. The most important lines in the development of the country have naturally been the **trans-continental** lines, of which there are six—one in Canada and five in U.S.A.

The **Canadian Pacific Railway** (C.P.R.) joins Halifax, in Nova Scotia, to Vancouver, on Burrard Inlet, opposite Vancouver Island, and runs through Montreal, Ottawa, Port Arthur (on Lake Superior), Winnipeg, Regina, and Calgary, crossing the main chain of the Rockies at **Kicking Horse** Pass, about 5,300 feet high, and the Selkirk Range at **Roger's Pass**, 4,500 feet. East of the Rockies the gradients are everywhere easy, but they are steep on the west, where the line, after crossing the Columbia River twice, descends the valleys of the Thompson River and the lower Fraser.

A southern branch diverges from the main line near **Medicine Hat** in Alberta, crosses the Rockies at **Crow's Nest Pass** (4,400 feet), and runs to the Kootenay mining district.

From Vancouver to Halifax the total distance through Canadian territory is 3,742 miles, but about 150 miles is saved by a line from Montreal through the State of Maine and St. John in New Brunswick.

The C.P.R. has numerous connexions southward with United States railways, perhaps the most important being the line from **Montreal** through the peninsula between Lakes Erie and Huron to **Detroit** and **Chicago**.

A northern branch joins **Calgary** to **Edmonton**, and another has been proposed from **Winnipeg** to **Port Nelson** on Hudson Bay. This would provide the wheat district of Manitoba with a nearer outlet to the sea than Montreal, but Hudson Bay is only open for navigation for three or four months in the year.

386. The United States trans-continental lines are:—

(1) The **Great Northern**, from Duluth, at the head of Lake Superior, to Seattle on Puget Sound.

(2) The **Northern Pacific**, from St. Paul, via Helena and Butte, to Portland, near the mouth of the Columbia River.

(3) The **Union and Central Pacific**, (*a*) from Chicago through Omaha and Cheyenne, and (*b*) from New York through Cincinnati, St. Louis, Kansas City, and Salt Lake City, with a branch through **Denver** from **St. Louis**; the

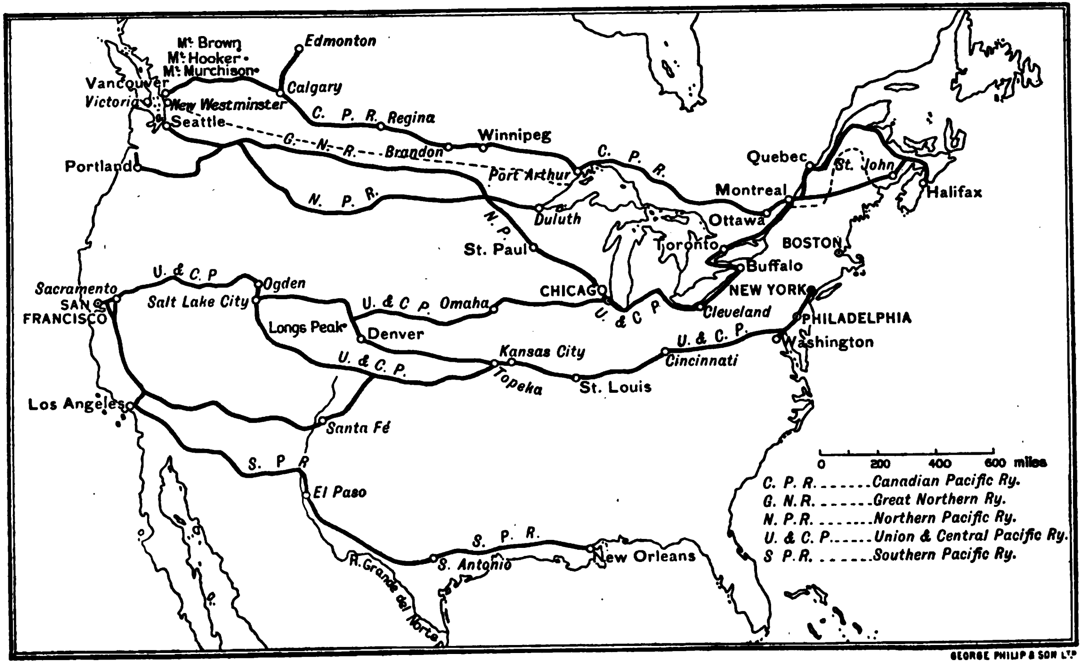

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Fig. 62.—Railways of the United States and Canada.

two lines unite near **Ogden**, west of the Wasatch Mountains, and run north of Great Salt Lake, and through Nevada to **Sacramento** and **San Francisco.**

(4) The **Atchison, Topeka, and Santa Fé** Railway, from **Kansas City** through New Mexico and Arizona, and then northward through the Californian Valley to San Francisco.

(5) The **Southern Pacific**, from **New Orleans**, with branch to **Galveston** in Texas, and then near the Mexican frontier to **Los Angeles**, and northwards to **San Francisco.**

Of these lines the Union and Central was the most difficult of construction, as the western mountains are widest along its route. It runs for over 1,200 miles at a height of above 4,000 feet, and at **Evans Pass**, a few miles west of Cheyenne, rises to over **8,000 feet.** The line from Denver to Salt Lake City is throughout its whole length over 4,000 feet high, and rises a few miles west of Denver to nearly 11,000 feet.

The eastward connexions of the above-mentioned lines are far too complicated for enumeration. Chicago, St. Louis, Kansas City, and St. Paul are great railway centres where many main lines meet.

INDUSTRIES AND COMMERCE.

387. Canada is not yet in any large sense a manufacturing country, nearly all its inhabitants being dependent on primary production—**agriculture, stock-raising, timber-cutting**, mining, and fur-hunting—and the related branches of commerce.

The United States, on the other hand, rank with the United Kingdom and Germany in manufactures, and, if not now, will probably in the near future excel them both.

American manufactures are not specialised in different districts to nearly the same extent as they are in England, except the iron and steel industry, in which **Pittsburg** and its immediate neighbourhood are certainly more important than all the rest of the country.

The cotton manufacture is principally carried on in the **New England** States, but is growing rapidly in the south (**Alabama**), where coal, iron, and raw cotton are all at hand, but large markets are remote.

388. The leading **exports** of U.S.A., approximately in order of value, are raw cotton, wheat and flour, live cattle, meat, dairy products, machinery, petroleum, copper, timber.

The leading **imports** are sugar, hides, coffee, raw silk, raw wool, rubber. About half the exports go to the United Kingdom, which sends about one-third of the imports.

The chief **exports** of Canada are timber, wheat, cheese, cattle, meat, gold, and ores; the chief **imports** are manufactured wool and cotton, iron and steel, and coal.

DISTRIBUTION OF POPULATION.

389. Only the north-eastern States and eastern Canada are at all thickly inhabited, and even there, outside a few large towns, the density of population does not approach that of the principal countries of Europe.

In Canada the provinces of Quebec and Ontario contained in 1901 about three-quarters of the population of the Dominion, but the central provinces, Manitoba, Saskatchewan, and Alberta, are being rapidly settled and occupied, while British Columbia nearly doubled its population between 1891 and 1901.

The whole of the **North-Western Territories**, with an area of over a million square miles, contains only some 50,000 Indians, fur hunters, and gold miners.

390. In the United States the north-east is the most densely, and the south-west the least densely, peopled, but, as in Canada, the population is increasing rapidly in the middle States, and more slowly in the east.

Owing to the vast scale of the commerce, both internal and external, the growth of great towns is a leading feature in the development of U.S.A. There are at least forty towns of over 100,000 inhabitants, containing an aggregate of about 15 million people.

Three of these towns—**New York**, **Chicago**, and **Philadelphia**—have populations considerably exceeding a million. This is all the more remarkable as not one of the three is the political capital, even of a State, while all the towns of corresponding size in Europe owe at least a part of their importance, and in some cases a large part, to their rank as seats of government.

The five States—New York, Pennsylvania, Illinois, Ohio, and Massachusetts (in order of population), contained in 1900 almost exactly **one-third** of the population of U.S.A., though their combined area is only about one-fifteenth of the total area.

The only **western** State with a large population is **California** (1½ million). Nevada, with an area larger than Great Britain, has less than 50,000 inhabitants.

Boundaries.

391. The boundary between Canada and U.S.A. is irregular in the east, but follows **no distinct natural** lines except where it runs centrally along the upper St. Lawrence, and through Lakes Ontario, Erie, Huron, and Superior, and from the north-west shore of the last lake along Rainy Lake and River to the Lake of the Woods. Hence the boundary follows the parallel of 49° N. to the Pacific Ocean; but Vancouver Island extends south to about 48°, and is wholly Canadian.

As usual in countries which have been partitioned before they were settled, or even explored in detail, the boundaries of states and provinces usually follow **lines of latitude and longitude.** The Mississippi, Ohio, and Ottawa are the only rivers which form state boundaries for a large part of their course. The main chain of the Rockies forms part of the eastern boundary of British Columbia, but the northern part of the province lies on both sides of the mountains.

TOWNS AND REGIONS.

Northern Atlantic Seaports.

392. New York, once the Dutch settlement of New Amsterdam, was built on **Manhattan** Island at the mouth of the Hudson River. The island has long been completely built over, and the city has extended to **Brooklyn**

on Long Island, with which it is connected by a fine suspension bridge, while **Jersey City** and **Newark**, on the right bank of the river, though technically separate, are essentially parts of "Greater New York," which contains at least 5 million people, and is the second city of the world.

New York owes its importance principally to the fact that the drowned valley of the Hudson is the only deep waterway through the Appalachian highlands. The tide reaches to **Albany**, 150 miles northward, whence waterways and railways diverge northward into Canada via Lake Champlain, and westward to the Great Lakes by the important Mohawk valley.

The railways to Buffalo and other lake ports by the **Mohawk route** still compete successfully with the shorter but more difficult lines, with steep gradients, running directly westward from New York, or rather from Jersey City on the opposite bank, with which New York is connected by ferries.

The line of the Hudson River, Lake Champlain, and the Richelieu River was of great military importance both in the Seven Years' War (1756-1763) and in the later wars between Britain and U.S.A.

New York is the **commercial** and **financial centre** of America, and nearly half the foreign commerce of U.S.A. passes through its 90 miles of piers and quays.

Boston, the second port of U.S.A., lies on three converging peninsulas at the head of a deep harbour at the mouth of the Charles River. It is nearer to Europe than New York is, but its hinterland is smaller, as the Hoosac Mountains separate it from the valley of the Hudson. Its suburb of **Cambridge** contains one of the most famous American universities (Harvard).

393. Philadelphia, the chief centre of German immigration, is at the head of ocean navigation on the **Delaware** River. It is a large manufacturing city, the chief centre in U.S.A. for **locomotives** and **shipbuilding**. Water power is obtained from the falls of the Schuylkill River, and there are inland routes both by the Susquehanna and the

Delaware, over one of the narrowest parts of the Appalachians, to the Pittsburg district.

Baltimore, on an inlet of Chesapeake Bay, lies between the mouths of the Susquehanna and the Potomac, and has the advantages of both routes inland. It is the nearest Atlantic port to Pittsburg. **Washington**, at the head of the Potomac estuary, is important as the **seat of government** of the United States. **Richmond** (Virginia), on the James River, is a great tobacco port.

394. Halifax, on a fine natural harbour on the east coast of Nova Scotia, and **St. John**, on the Bay of Fundy at the mouth of the St. John River, are important as the only Atlantic ports of Canada which in ordinary winters are **free from ice**. They are termini of the Canadian railway system, and Halifax is a fortified **naval base**.

395. Newfoundland, the earliest British colony (1583), is an **island** larger than Ireland, lying across the mouth of the St. Lawrence, separated by the Strait of Belle Isle from Labrador, and by the wider Cabot Strait from Cape Breton Island.

It consists mostly of a low bleak **plateau**, from 500 to 1,000 feet high, with ridges and valleys lying in a north-east to south-west direction, as shown by the rivers and by the peninsulas and gulfs of the highly indented rocky coast.

The capital, **St. John's**, and the great bulk of the population, are in the peninsula of Avalon in the south-east, near the great shallows to the south known as the **Grand Banks**.

The **Grand Banks** are the greatest cod-fisheries in the world, and are crowded in summer (June to November) with fishing vessels from Newfoundland, the New England States, and the small French islands of **St. Pierre** and **Miquelon**, the only remnants of French power in North America, outside the West Indies.

There are nearly 3,000 sailing ships from Newfoundland alone engaged in the fishery, and fish and fish products form the only important export.

396. Quebec, the "Gibraltar" of America, lies on a rocky promontory between the St. Charles River and the St. Lawrence, at the lowest point where the latter can be bridged. Owing to the deepening of the St. Lawrence, **Montreal,** built on an island at the confluence of the Ottawa River, has displaced Quebec as the chief port and commercial town of Canada. It lies at the head of ocean navigation, with easy routes to the forests along the Ottawa, to the fertile peninsula of southern Ontario, and to the great wheat-growing West.

Ottawa, on the navigable river of the same name, about 100 miles west of Montreal, is the political capital of Canada and also a great centre of the timber trade. It is connected by the Rideau Canal and Lake with **Kingston** on Lake Ontario.

Cotton Ports.

397. The chief cotton ports of U.S.A. are **New Orleans, Galveston**, and **Mobile**, on the Gulf of Mexico, and **Savannah** and **Charleston** on the Atlantic. The harbours of all these are, however, only kept open with difficulty.

New Orleans is by far the most important, owing to its position on the main navigable branch of the Mississippi delta, about 100 miles from the mouth. It thus has to some extent the whole Mississippi basin as its hinterland, and exports much wheat as well as cotton, in spite of its distance from the wheat belt.

Pacific Ports.

398. San Francisco is magnificently situated on a promontory which forms the south side of the strait called the Golden Gate, leading through the coast range into a large landlocked bay. San Francisco is thus the outlet for the gold, wheat, fruit, and timber of California.

San Francisco is almost the only large port in the world where a considerable part of the traffic is carried on by **sailing ships**. These are principally English. The voyage round Cape Horn is so long that for bulky products, such as wheat and timber sailing ships are found to be as economical as steamers, while more valuable articles generally cross the continent by rail. San Francisco is one of the ports which will probably derive most benefit from the Panama Canal.

399. Vancouver, on Burrard Inlet, is the chief port of British Columbia, and the terminus of the C.P.R. It lies immediately opposite the coal-field of **Nanaimo** in Vancouver Island, which produces the best coal found anywhere on the Pacific coast. **Victoria**, in the extreme south of Vancouver Island, is the capital of British Columbia. Near it the fine natural harbour of **Esquimalt** has been strongly fortified and made into a naval base.

The ports in the north-west of U.S.A. are rapidly growing on account of their natural harbours and the export of fine timber and wheat. The chief of them are **Portland** (Oregon), on the Columbia River, and **Tacoma** and **Seattle**, both on Puget Sound.

Collectively, the Puget Sound ports rank fifth in U.S.A. in the tonnage of ships entered and cleared, being exceeded only by New York, Boston, New Orleans, and Philadelphia.

Inland Towns.

400. The chief inland towns of North America are the **lake ports** and **river ports**; for inland navigation, though not so important as it was owing to the growth of railways, is still a large factor in American commerce.

Chicago, a prairie village seventy years ago, is now a town of nearly two million inhabitants. It is situated almost at the extreme south of Lake Michigan, at a point where all land traffic from the manufacturing east and north-east must turn round the end of the lake to reach the grain-growing west and north-west.

Only a low watershed, crossed by a canal, separates Chicago from the Mississippi basin, while Lake Michigan affords a waterway northward. Owing to its situation at the **junction of many routes**, Chicago has become the greatest market in the world for timber (grown round the lake), wheat, cattle, and meat products, and has many varied industries dependent on these trades.

The other important lake ports are **Milwaukee**, on the west of Lake Michigan, a great brewing centre; **Duluth** and **Superior**, at the head of Lake Superior, sending grain and iron ore eastward, and coal westward; **Port Arthur**, on the north of Lake Superior, the lake port for the wheat of Manitoba; **Detroit**, between Lakes Erie and Huron, and **Toronto**, the second largest town in Canada, on Lake Ontario (both on the most direct route from Chicago to Montreal); **Cleveland**, on Lake Erie, the port nearest to Pittsburg; **Buffalo**, at the foot of Lake Erie, deriving electric power from Niagara, and connected by canal and river with New York.

401. The chief towns of the **northern prairies** are **Winnipeg** (**not** on Lake Winnipeg), situated in the richest part of the wheat belt, at the confluence of the Red River and the Assiniboine, both of which are navigable; **Regina**, the capital of Saskatchewan, further west, where wheat-growing begins to give place to cattle-rearing; **Minneapolis**, the greatest flour-milling town in the world, obtaining power from the Falls of St. Anthony, and situated about half way between the Red River and Chicago; and its rival, **St. Paul**, close by, at the head of navigation on the Mississippi.

Besides the two last-mentioned places the **Mississippi basin** contains a number of large towns, all of which are changing, or have changed, with the westward movement of population, from mere distributing and collecting centres into great industrial towns.

St. Louis, near the junction of the Missouri and Mississippi, is the chief river port of U.S.A., and the fact that it was till late in the nineteenth century the lowest bridge-town on the river sufficed to make it a great railway centre.

Near the head of navigation on the Ohio River is **Pittsburg**, the great **iron** and **steel** centre, on a site of historical importance, as Fort Duquesne stood in the virgin forest where the blast furnaces now are; the name Pittsburg commemorates the Minister who destroyed French power in America. **Cincinnati** is situated on a sharp southward bend of the river and is an important manufacturing city; **Louisville**, in Kentucky, is one of the chief tobacco centres of the country; **Cairo** is at the confluence of the Ohio with the main river.

In the western Mississippi basin the chief towns are **Kansas City** and **Omaha**, both confluence towns on the Missouri, large railway centres, and cattle and meat markets.

On the high western plains, where agriculture is less important than cattle-rearing, on account of the dry climate, the chief towns are **Calgary**, the capital of Alberta in Canada, and **Denver**, a much larger town, the capital of Colorado (U.S.A.), and the chief commercial centre of the Rocky Mountain States. Both towns lie almost at the foot of the mountains, and have important **mining** districts to the west of them. Near Denver considerable areas (several thousand square miles) have been converted by irrigation into good agricultural land.

CHAPTER XVI.

SOUTH AMERICA.

Position and Area.

402. South America is somewhat smaller in area than North America, and lies a good deal farther east. Its **west** coast, in fact, lies almost entirely within the same limits of longitude, 70°—80° W., as the **east** coast of the United States. The area is about seven million square miles, about four-fifths of which lies within the tropics.

The extreme points are: on the east, Cape Branco, 35° W.; on the west, Punta Pariña, 81° W.; on the north, Punta Gallinas, 12½° N.; and on the south, Cape Horn, 56° S.

Coasts.

403. In proportion to its area South America has less coast line than any other continent except Africa, and its shape on the whole is even more compact than that of Africa. From about 42° S. to Cape Horn the western coast is deeply indented with fiords and fringed with islands.

The largest island, **Tierra del Fuego,** is separated from the mainland by the narrow tortuous **Magellan Strait,** much used by steamers to avoid the longer passage round Cape Horn, which is still, however, generally adopted by sailing-ships, on account of the difficulties of the Strait. The seas around this southern extremity of South America are perhaps the stormiest in the world.

Except in the south-west, the coast of South America is singularly uniform. The west coast is high and steep, with only one considerable opening, the **Gulf of Guayaquil.** On the north coast are the **Gulf of Darien** and the **Gulf of Venezuela**, the latter separated by a bar from the great lagoon of **Maracaibo.** Further east, the mountains of Venezuela approach close to the shore, which is again high and steep.

The **east** coast of the continent is everywhere low and shelving, except about the latitude of Rio de Janeiro, where mountains again approach the sea. The only considerable openings on the east coast are the mouths of the rivers, and two large lagoons in southern Brazil.

The great upward movement of the earth's crust which produced the Andes is apparently not yet over, as most of the **west coast** of South America is still rising. As usual in regions of rising coasts, earthquakes are frequent.

LAND RELIEF.

404. South America may be divided into six regions—three highland, and three lowland. The latter, however, as will be seen later, are more or less continuous. The **highland** regions are (*a*) the Andes, (*b*) the Highlands of Brazil, (*c*) the Highlands of Guiana. The **lowlands** are the basins of the Orinoco, the Amazon, and the Parana-Paraguay.

The Andes.

405. The **Andes** form the longest continuous mountain chain in the world. There are many peaks over 20,000 feet in height, and the lowest passes are over 11,000 feet. Among the highest peaks are **Chimborazo** (20,500 feet), **Cotopaxi** (18,500 feet) in Ecuador, **Sorata** (21,500 feet), **Illimani** (21,000 feet) in Bolivia, and **Aconcagua** (23,000 feet) in Chile; of these all except Sorata are volcanoes.

South of the equator the mountain system consists for the most part of two parallel ranges, enclosing a plateau of internal drainage, which is narrow in the south and gradually widens out and reaches its greatest width in the **Plateau of Bolivia**, a basin draining into **Lake Titicaca.**

Further north the mountain system decreases in width, its narrowest part being opposite the Gulf of Guayaquil. On the **Peruvian Plateau** are two longitudinal rivers, the Marañon and Ucayali, which flow in opposite directions, and then, breaking through the eastern range in narrow gorges, unite to form the Amazon.

A little north of the equator the mountains separate into four diverging ranges with deep river-valleys between them. The easternmost range is prolonged along the north coast as the **Venezuelan Range**, which may be considered as continuous with the partially submerged chain forming the West Indian Islands from Trinidad to Cuba.

The Eastern Highlands.

406. The **Eastern Highlands** of South America (those of Guiana and of Brazil) may be regarded as two islands separated by the alluvial plain of the Amazon. They are of much greater age than the Andes, and, owing to prolonged erosion, of much less height.

The **mountains of Guiana** (highest point **Roraima**) form the watershed between the basins of the Orinoco and the Amazon. They lie chiefly in southern Venezuela, not in Guiana.

The **Brazilian Highlands** occupy a much greater area than those of Guiana. Their highest points lie near the sea about the latitude of the tropic. Hence the longer rivers rising in this region flow at first away from the sea —the Parana and Uruguay westward and the São Francisco northward.

RIVERS.

407. The western chain of the Andes forms a continuous watershed throughout the length of the continent; the eastern chain, as already mentioned, is cut through by rivers in some parts. The rivers of the west are shorter and much less important even than the western rivers of North America.

The main slope of the continent is from west to east in the north (Rivers Orinoco, Amazon, São Francisco); from north to south in the middle, between the Andes and the Brazilian Highlands (Rivers Parana, Paraguay, Uruguay); and again from west to east in the southern extremity of the continent (Rivers Colorado, Negro).

The Orinoco.

408. The **Orinoco** (1,200 miles), the third largest river of the continent, rises on the south of the Guiana Highlands, flows round their western end, receiving many tributaries from the Andes, and then, turning eastward through a low flat plain, reaches the sea, just opposite Trinidad, in a thickly-wooded delta as large as Wales.

Not far from its source in southern Venezuela the Orinoco divides into two branches, of which the smaller one, the **Cassiquiare**, flows down the southern slope of the ridge into the **Rio Negro**, the chief northern tributary of the Amazon; the latter is thus connected with the Orinoco by a natural canal.

The Amazon.

409. The **Amazon** (4,000 miles), the greatest river in the world, has its sources in several streams of the Peruvian Andes, the **Marañon** being generally taken as the main river. After flowing for some 300 miles along the plateau, the river breaks away to the east, and preserves this direction, tending slightly northwards, till it enters the Atlantic by two principal mouths, the larger of which is on the equator.

The area of the Amazon basin is about **two million** square miles, nearly one-third of the entire continent, and the river receives affluents from all the three mountain systems. The chief northern tributary, as above mentioned, is the **Rio Negro**, while from the south the largest tributary is the **Madeira**, rising on the edge of the Bolivian Plateau.

The **Tocantins**, rising in the Brazilian Highlands, flows nearly due north into the southern or Para mouth of the Amazon. The Tocantins is connected by another natural canal with the São Francisco.

The slope of the Amazon is extremely gentle; 1,800 miles from the mouth it is only about 300 feet above sea-level. It is **navigable** by small steamers to the foot of the Andes, and the largest ships can ascend it for more than 1,000 miles from the sea.

The River Plate.

410. The third great river-system of South America—the second in point of size—is that which enters the sea by the great estuary called the **Rio de la Plata**, or "River Plate," the distance from the remotest source to the sea being 2,300 miles.

The main stream, called in its upper course the **Paraguay**, and lower down the **Parana**, rises in the Plateau of **Matto Grosso**, the north-western spur of the Brazilian Highlands. Its source is within four miles of one of the southernmost tributaries of the Amazon, and the rivers are frequently connected by floods.

The chief tributary of the Paraguay is the **Parana**, coming from the coast range behind Rio de Janeiro. The **Uruguay**, rising in the same range further south, flows west and then south into the estuary.

South of the Rio de la Plata the chief rivers are the **Rio Negro** and the **Colorado**, flowing into the Atlantic.

CLIMATE.

Winds and Currents.

411. The greater part of South America is in the region of the **south-east Trade Winds**. On the west coast these are on the whole off-shore winds, or are parallel to the coast. They have therefore a cooling and drying effect on this side of the continent.

They also drive northwards along the coast a cold current of water, the **Humboldt Current**, an offshoot of the West Wind Drift further south. The general result is that places on the west coast of South America, except in the extreme north and south, are relatively cool and dry.

Nearly the whole of the east coast, on the other hand, is bathed by a warm current. The main **Equatorial Current** which flows into the Caribbean Sea sends off a branch southward along the coast of Brazil. The sea-water off Rio de Janeiro has the same average temperature as the water off Guayaquil, 20° further north on the opposite coast.

As there is no continuous mountain barrier in the east, the warm winds from the Atlantic extend their influence to the heart of the continent.

Isotherms.

412. On the eastern slope **isotherms** follow roughly parallels of latitude, being somewhat convex towards the south. Across the Andes, however, they turn sharply to the north-west (see Fig. 30). North of the Tropic of Capricorn the average temperature varies only between about 70° F. and 80° F.—except of course in the mountains. The summer isotherm of 50° F. and the winter isotherm of 30° F. both lie near Cape Horn.

Rainfall.

413. There is an **abundant rainfall** over the whole continent north of the equator. From 0° to 30° S. the rainfall is heavy on the east side from the coast to the Andes, and is very small on the west side, the mountains forming an insuperable barrier to the easterly rain-bearing winds.

Beyond Lat. 35° S. these conditions are reversed. This region is under the influence of the "Brave West Winds," which deposit a heavy rainfall on the short western slope of the continent, while the long eastern slope is very dry.

Seasonal variations of rainfall are not very well marked in South America, but as usual in tropical countries more rain falls in summer than in winter. Part of central Chile, however, round Valparaiso, has a climate of the **Mediterranean type**, with only **winter** rain.

This is owing to the fact that in the southern summer it is just on the edge of the **trade-wind** region, while in winter it is exposed to the westerly rain-bearing **anti-trades**. Further south, where these winds blow steadily all the year round, it rains almost every day.

No part of South America has a climate of the extreme "continental" type such as we find so constantly in the northern continents. The greatest annual range of temperature is on the dry steppes between the Parana River and the Andes. The following table shows the rainfall and temperatures of six places in different parts of the continent:—

	Latitude.	Highest Monthly Mean Temp. °F.	Lowest Monthly Mean Temp. °F.	Range of Temp.	Annual Rainfall. Inches.
Carácas... ...	10½° N.	73	68	5	31
Pará	1½° S.	82	79	3	75
Rio de Janeiro	23° S.	80	70	10	43
Iquique ...	20° S.	75	59	16	0·5
Buenos Aires	34½° S.	75	50	25	34
Valparaiso ...	33° S.	63	52	11	14

VEGETATION.

414. Owing to its heavy rainfall and perpetual high temperature the Amazon basin is almost completely covered with dense **tropical jungle**, known as the **selvas**, and forming the greatest forest area in the world. Similar forests are found on the rainy north-west coast and along almost all the rivers, except those south of the Rio de la Plata.

The basin of the Orinoco is mostly covered with more open forest, while to the north and west of the river, where there is less rainfall, the country consists of open grassy plains called **llanos**.

In the south, the middle of the Argentine Republic and most of Uruguay are also immense open plains, here called the **pampas**. In the east they form very rich pastures, supporting vast herds of cattle, sheep, and horses. Farther west, as the rainfall diminishes, they become less fertile, and near the Andes almost **desert** conditions prevail, in the absence of irrigation.

The Andes exhibit the usual Alpine flora of mosses, lichens, etc., below the snow line. Some parts of the range, however, are almost devoid of vegetation, especially in northern Chile. From Valparaiso to the extreme south the lower slopes are covered with temperate mountain forest, chiefly pine.

Deserts.

There are three distinct areas of desert in South America: (1) The almost perfectly rainless coast of **Peru**, a strip some 20 miles wide between the sea and the mountains. (2) The **Atacama Desert** of northern Chile, one of the longitudinal valleys of the Andes, and rich in **nitrate of soda**. (3) The **Shingle Desert** of Patagonia, a stony plain with dwarf scrub and occasional oases of pasture near rivers; it is sparsely inhabited by a remarkably tall tribe of Indians.

PEOPLE AND STATES.

415. The population of South America is considerably less than that of the United Kingdom. With the exception of the three small colonies of Guiana—British, Dutch, and French—the continent consists of **ten independent republics**, mainly of Spanish origin.

The largest of them, however, **Brazil**, which occupies nearly half the continent, was colonised by the Portuguese. Spain lost her South American colonies early in the nineteenth century. In 1822 Brazil became an "empire," independent of Portugal, but was converted into a republic in 1889.

The republics are mostly of small political stability, and have frequently been convulsed by revolutions and civil wars, which have greatly retarded their development, so that South America is in many respects the most backward of all the continents, in spite of its enormous natural resources. **Chile** and the **Argentine Republic** appear to be the most stable, enterprising, and settled of the South American states.

The population is very mixed. Only about a quarter of it is pure white; negroes form about 10 per cent.; and the remainder consists chiefly of Indians or half-breeds. The whites are mostly of Spanish or Portuguese descent, but Italians are numerous in Brazil and in the Argentine, and there are nearly a million Germans in the south of Brazil.

Boundaries.

416. Political **boundaries** in South America are mostly artificial in character, and are the subject of frequent and apparently interminable disputes between the republics. Parts of the upper Amazon basin are claimed by at least three powers, but as this region is still almost unexplored and is totally uncivilised, boundary disputes are at present of little importance.

In the south of the continent, boundaries are more nearly coincident with physical features. The main chain of the Andes forms the greater part of the boundary between Chile and the Argentine Republic; though in the extreme south Chile extends right across the continent, on both sides of Magellan Strait. The small republic of Paraguay is almost encircled by the Rivers Parana, Paraguay, and Pilcomayo; and the Uruguay River is also a frontier for the greater part of its course.

REGIONS AND TOWNS.

417. From the point of view of production and commerce South America can be divided into **five** regions: (1) the **coast plains** of the west, isolated by a vast ocean on one side, and on the other side by (2) the lofty barrier of the **Andes**, which are inhabited and productive up to a height of 10,000 or 12,000 feet in the tropical part of the continent; (3) the **forests**, wholly on the eastern slope of the continent, except in the extreme north and south; (4) the **Pampas**, which may be roughly described as the River Plate region, commercially the most important part of South America; (5) the **Llanos** of the Orinoco, hitherto the least important.

I. THE WEST COAST.

418. A narrow **coast plain**, from 20 to 50 miles wide, extends along the west of South America through about 50 degrees of latitude. It gets on the whole narrower towards the south, and disappears altogether in southern Chile, where the mountains rise directly from the sea. Though very uniform in structure, the plain, owing to its great extension and its backing of high mountains, exhibits great diversities of **climate**, and therefore of **productions**.

From the Gulf of Guayaquil northwards there is an abundant rainfall and a very high temperature. The country is densely **forested**, especially with palms and cabinet-woods, and rare orchids are found. Cotton, coffee, sugar, and cocoa are grown, chiefly for home consumption. **Cocoa**, however, is especially important in Ecuador, being the principal export of that country. The low northern shore of Colombia, as far as Lake Maracaibo, may be considered as continuous with the west coast, the climate and products being similar.

The chief commercial town and port of this region is **Barranquilla**, on the lower Magdalena, the fourth largest river of the continent and the chief artery of trade in Colombia. **Cartagena**, some miles to the west, has a fine natural harbour, but has been eclipsed by its more favourably situated rival.

419. In Peru and northern Chile the coast plain is almost perfectly rainless, and can only be cultivated near the short rivers, where **cotton, coffee**, and **sugar** are the chief crops. Some of the small islands near the coast furnish **guano**, used as a manure; but the supplies are approaching exhaustion.

The most important economic product of the rainless coast is **nitrate of soda**, a valuable manure found in abundant deposits in northern Chile, and chiefly exported from **Iquique**. The largest town is **Lima**, the capital of Peru, lying about five miles inland from its port of **Callao**.

The ports of **Arica** and **Antofagasta** are chiefly important as outlets for the productions of the inland republic of Bolivia.

420. From about 30° S. the coast plain itself is of little importance, being confined by coast ranges, behind which, however, lies a long valley some 30 miles in width, known as the **Central Valley of Chile**. It is fertile and well-watered, with a delightful and healthy Mediterranean climate, like that of the Californian Valley, which the Central Valley closely resembles.

In the extreme south the highly indented coast strip has a very **wet, cool, climate**. Its few inhabitants are engaged in rearing cattle and sheep.

On the western side of the Central Valley stands **Santiago**, the capital of Chile, in a rich wheat and vine district. Its port, and the chief port of all western South America, is **Valparaiso**, standing on an open bay facing north, and thus sheltered from the prevailing southerly winds of this region.

Chile possesses the most southerly town in the world in **Punta Arenas**, on Magellan Strait, a naval station and port of call for steamers passing through the strait.

II. THE ANDES.

421. The general configuration of the Andes has been already described. The middle slopes of the mountains, and the high basins enclosed between the ranges, have a **cool, temperate** climate, and on them is concentrated most of the white population of western South America, the lower ground being inhabited almost solely by Indians and half-breeds (except in Chile).

The **products** of the temperate mountain zone are chiefly **wheat, maize**, and **wool**. Among wool-bearing animals the large flocks of llamas, alpacas, and vicuñas which inhabit the Peruvian plateau are worthy of note. They are nearly-allied animals peculiar to Peru, and furnish specially fine kinds of wool.

The widest part of the Andes system is the Plateau of Bolivia, which has an average elevation of about 12,000 feet, and is perhaps, with the exception of Tibet, the highest inhabited region of the globe.

Towns in the Andes.

422. The Venezuelan Coast Range, which may be considered as an outlying spur of the Andes, contains **Carácas**, the capital of Venezuela, and **Valencia**. Both towns are connected by short mountain railways with their respective ports, **La Guayra** and **Puerto Cabello**.

Bogotá, the capital and only large town of Colombia, lies far inland, 9,000 feet above the sea, and is one of the most inaccessible large towns in the world. At about the same elevation, but close to the equator, stands **Quito**, the capital of Ecuador. Not far from Quito is Cotopaxi, the highest active volcano in the world.

In Peru **Cerro Pasco** is a centre of silver mining, and is connected with Lima and the coast by a very remarkable railway, tunnelling the Andes at a height of over 15,000 feet. Another line, nearly as high, connects **Arequipa**, further south, with Lake Titicaca, where a service of steamers runs between Peru and Bolivia.

Cuzco, the ancient capital of the Empire of the Incas, is of no modern importance.

Sucre, the nominal capital of Bolivia, is unimportant, the chief town being **La Paz**, near the southern end of Lake Titicaca, between the two giant peaks of Sorata and Illimani. The once world-famous silver mines of **Potosi** have now only a small output, but Bolivia is still very rich in silver and tin, exported chiefly through **Antofagasta**. The chief economic product of the Chilian Andes is copper, mainly exported through **Coquimbo** (Serena).

III. THE FORESTS.

423. The **forests** of South America cover almost the whole basin of the Amazon, and border all the other rivers (east of the Andes) as far as about 30° S. They also extend along the whole eastern coast from the mouth of the Orinoco to the extreme south of Brazil. The chief forest products are **india-rubber**, Brazil nuts, **timber** (cabinet and dye woods), and medicinal plants (especially cinchona and coca, from which the valuable alkaloids **quinine** and **cocaine** are respectively derived).

The commerce in these products naturally passes chiefly along the Amazon and its tributaries, as there are **no roads** and **no railways** over the greater part of the forest region. India-rubber has so far been chiefly obtained from the wild tree, but regular cultivation is extending. The medicinal plants above mentioned grow especially in the eastern forests of Bolivia and Peru; it was in the latter country that "Peruvian bark," the bark of the cinchona tree, was first used as a febrifuge.

The small republic of **Paraguay**, between the rivers Paraguay and Parana, is roughly the southern limit of the tropical forest. The chief exports are very fine **oranges** and **maté** or Paraguay tea, a beverage largely consumed throughout South America.

The main outlet for the commerce of the whole Amazon region is **Para** (also called **Belem**), on the Tocantins mouth of the river. **Maranhão**, further east, also has a share of the same trade. Far inland, **Manaos** is an important centre of river navigation, near the junction of the Rio Negro with the Amazon.

The exports of Paraguay naturally go southwards from **Asuncion**, the only important town, to the river Plate.

424. There are two coast districts of Brazil where the primeval forest has given place to regular cultivation, and where there is a considerable density of population:—

(1) The most easterly part of the country, between the two important ports of **Pernambuco** and **Bahia** (**San Salvador**), is chiefly devoted to the cultivation of sugar, cotton, and tobacco. There is a considerable system of railways stretching inland from the coast to the river São Francisco.

(2) The coastal district near the tropic of Capricorn is the great **coffee** region of Brazil, and indeed of the world, as it produces about two-thirds of the world's supply. Its principal outlet to the sea is **Rio de Janeirò**, the capital of Brazil, and the second largest town south of the equator. It is situated just within the tropic on a fine natural harbour near the central and highest part of the Brazilian Highlands.

The coffee district has another outlet further south at **Santos**, the port of **São Paulo**, the chief inland town of this region. A large system of railways radiates from Rio de Janeiro and from São Paulo.

425. The three adjoining colonies of **Guiana** are the only parts of the mainland of South America held by European powers, and they are comparatively unimportant. French Guiana (capital **Cayenne**) is chiefly used as a convict station. Surinam, or Dutch Guiana (capital **Paramaribo**), produces chiefly **sugar** and cocoa, with a little gold. British Guiana is much more densely populated than either the French or the Dutch province. Its capital is **Georgetown**, in the district of Demerara, famous for its **sugar**. Gold and diamonds are also exported.

IV. THE PAMPAS.

426. The Pampas are the immense almost treeless plains which cover the greater part of the Argentine Republic, most of Uruguay, and part of southern Brazil (Rio Grande do Sul). They extend from **El Gran Chaco** ("the great hunting ground"), on the tropic of Capricorn, to the **Shingle Desert** of Patagonia; and from the estuary of the River Plate to the foot-hills of the Andes. The lower basin of the Parana and the districts bordering on the great estuary contain the great majority of the population. The main occupation is the **rearing of animals**—sheep, cattle, and horses.

Uruguay and Rio Grande do Sul, having more rainfall than the rest of the Pampas, are especially suitable for **cattle**; and in them the rearing and slaughtering of cattle and the preparation of meat products are almost the sole industries.

In the Argentine Republic **sheep** are reared in vast numbers and the wool trade is becoming very important; nearly the whole of it is with continental Europe, only a small fraction coming to England. A large and rapidly increasing area of the Argentine is under **wheat** and maize, and the country may in time rival even the United States as a granary and meat-store for Europe.

The staple exports of the Pampas region as a whole are **wool**, **wheat**, maize, **live animals**, **meat**, hides, tallow, etc. Sugar and coffee are grown, chiefly for home consumption, in the warmer northern provinces of the Argentine. **Minerals** of many kinds are abundant, but up to the present little worked, the economic activity of the region being so far concentrated on animal and agricultural products. The River Plate is the only part of South America that attracts a large and regular stream of immigrants, chiefly Italians.

A large system of railways, still rapidly extending, radiates westward and northward from Buenos Aires. The main western line is the only transcontinental line in South America; it crosses the Andes by a long tunnel through the Uspallata Pass (12,800 feet high), just south of Aconcagua.

Towns of the Pampas

427. **Buenos Aires**, the capital of the Argentine, with a population of over a million, is the largest city in the southern hemisphere. It is a fine city architecturally, and is healthy and well governed. Its harbour is not naturally a good one, but has been so improved by engineering works that large steamers can load and unload close to the city. Lower down the estuary, on the same side, is the growing port of **La Plata.** **Rosario** is an important river-port and railway centre about 150 miles up the Parana. **Tucuman** is the commercial centre of the sugar district of the north. **Cordoba** and **Mendoza** are other inland towns of some importance.

On the north side of the Rio de la Plata stands **Montevideo**, the capital and only large town of Uruguay. It has a good natural harbour, which is, however, getting shallower through the deposit of silt. **Fray Bentos** and **Paysandu** are two small towns near the river Uruguay, and are famous for their tinned meat and meat essences.

In the Brazilian province of **Rio Grande do Sul**, largely inhabited by Germans, the chief town bears the same name as the province, and stands at the entrance of the great lagoon of Patos, at the other end of which is **Porto Alegre.**

V. THE LLANOS.

428. The **Llanos** of the Orinoco are similar in general character to the Pampas, and the main occupation is the rearing of cattle and horses. The economic importance of the whole region is, however, small, owing partly to the hot climate, and largely, no doubt, to the extremely unsettled and backward state of the government of Venezuela. There seems no natural reason why the Orinoco should not become a great highway of commerce.

At present the only town of any importance on the river is **Ciudad Bolivar**, which, though far inland, is accessible to large ships. Yuruari, the Venezuelan province adjoining British Guiana, is rich in gold.

Islands of South America.

429. The **Falkland Islands**, a British Crown Colony, are situated in the South Atlantic about 300 miles east of Magellan Strait. There are two large islands and about 100 small ones, the total area being a little larger than that of Yorkshire. The inhabitants number only about 2,000, nearly half of whom live in **Stanley**, the one town. The only industry is sheep-farming, and the exports are wool, skins, and frozen mutton. The islands are of some importance as a calling-place for ships bound to or from the Pacific Ocean.

The volcanic group of the **Galapagos Islands**, lying on the equator about 700 miles west of the mainland, belong to Ecuador. They are remarkable (1) geographically, as being the coolest equatorial land, owing to their position in the path of the cold Humboldt current; and (2) scientifically, from the fact that they contain a great number of species of plants and animals found nowhere else.

CHAPTER XVII.

AFRICA.

General.

430. Africa, the most tropical of the continents, has an area of about 11½ million square miles, equal to about two-thirds of the area of Asia or three times that of Europe. Its greatest length, lying nearly on the meridian of 20° E., is nearly bisected by **the equator**. The greatest width lies about Lat. 12° N.

The **Tropic of Cancer** is just south of Aswan, and passes across the middle of the Sahara; the **Tropic of Capricorn** is just south of Walfisch Bay, and passes across the Kalahari Desert and the north of the Transvaal, cutting the Limpopo River twice.

Africa is on the whole considerably further north than South America, the line of greatest width in Africa passing through the extreme north of South America, while the latter continent extends about 20° further south than Cape Town.

The extreme points of Africa are **Cape Bon** in Tunis, **Cape Verd** in Senegal, Cape **Guardafui** in Somaliland, and Cape **Agulhas** in Cape Colony. The length from north to south is about 5,000 miles and from east to west about 4,500 miles.

Coasts and Configuration.

431. Africa is distinct from all the other continents in having no extensive low plains (Australia is nearest to it in this respect). The coast of Africa is **less indented** than that of any of the other continents, and there are very few good natural harbours. The coast is generally low, but the coast plain is narrow, and, except in the extreme north and south, everywhere very unhealthy. The continental shelf is everywhere narrow.

The only distinct mountain range in Africa is the **Atlas Mountains**, a series of folded limestone ridges extending from Cape Nun in the south of Morocco to Cape Bon in Tunis. The country between the main Atlas range and the lower coast ranges to the north is a region of fertile plains and valleys called the **Tell.**

A deep **depression** (partly below sea level) lies south of the Atlas, so that this range, which rises to about 15,000 feet in the west, is quite unconnected with any other African highlands.

432. Apart from the Atlas system and the low sandy plain of northern Tripoli, Africa consists essentially of (1) a **low plateau** (600-1,500 ft.) in the north, crossed diagonally from north-west to south-east by a belt of highlands (the Tibesti Mountains); and (2) a **high plateau** (2,000-5,000 ft.) in the south and east, filling nearly the whole continent south of a curved line, slightly convex to the south, from Suakin to Loanda.

The **northern plateau** consists almost wholly of **desert,** with scattered oases, of which the largest is the narrow trench, from 5 to 10 miles wide, cut through it by the Nile below Khartum.

East of the Nile is the **Nubian Desert**, and west of it the **Libyan Desert**. From the latter to the Atlantic stretches the **Sahara** or Great Desert. Apart from isolated rocky highlands, the surface of the desert is by no means uniform, and the shifting sand dunes sometimes reach a height of 600 feet.

The edges of the **southern plateau** are generally considerably higher than the interior, and are steep on the seaward faces. To this is due the fact that, while some African rivers do not reach the sea, those that do so fall over the edge of the plateau in rapids or cataracts, and are therefore of **little use for navigation**. This is one of many causes which make Africa commercially the least important of the continents.

The greatest mass of high ground in Africa is the **Abyssinian Plateau**, mostly over 8,000 feet in height. It shows signs everywhere of past volcanic activity, exhibiting weathered sheets of lava and denuded volcanoes, some of which rise to 15,000 feet. Abyssinia drains chiefly to the Nile by the **Blue Nile** and the **Atbara.**

433. Eastern Equatorial Africa contains two very remarkable **rift-valleys** of great dimensions. The eastern or **Eritrean** rift-valley stretches southward from Abyssinia, and its course is marked by a long string of long narrow lakes, of which **Lake Rudolf** is the largest. On the eastern edge of the valley rise the isolated extinct volcanic cones of **Kenya** (on the equator) and **Kilimanjaro**, the highest mountains in Africa—each about 17,000 feet—except **Ruwenzori**. They were probably formed during the great convulsion which produced the valley.

The western rift-valley is parallel to the eastern, and contains the lakes **Albert Nyanza** and **Albert Edward Nyanza**, both draining to the Nile, and **Tanganyika,** which in time of flood has an outlet by the Lukuga to the Congo, but appears to be drying up. On the east of this valley, between the two first-mentioned lakes, is the lofty peak of **Ruwenzori** (about 19,000 feet), also an old volcano. **Kirunga**, south of Albert Edward Nyanza, is a still active volcano.

The two rift-valleys converge towards the head of Lake **Nyasa**, which may be regarded as a continuation of either, or both. It drains by the **Shiré** River to the Zambesi.

The largest lake in Africa, **Victoria Nyanza**, the chief source of the Nile, lies on the equator in a shallow depression of the plateau between the two rift-valleys, and is of quite a different type from the rift-lakes, as is also **Tsana,** the chief source of the Blue Nile, occupying a similar depression in Abyssinia.

434. In the south-east of Africa the edge of the plateau is known as the **Drakensberg** Mountains, which contain several peaks over 10,000 feet high, and form the boundary between Natal on the east and Basutoland and the Orange River Colony on the west.

Mont aux Sources, where these three colonies meet, is the chief river centre of South Africa, giving rise to the **Tugela, Orange**, Caledon (a tributary of the Orange), and Vilge (a tributary of the Vaal).

In the east of the Transvaal a lower but well-defined ridge, the **Lebombo** Mountains, forms the boundary between the Transvaal and Portuguese East Africa.

435. Cape Colony rises from the sea in a series of distinct flat terraces, separated by steep narrow ridges. The first ridge, the Lange Bergen, separates the narrow coast plain from the **Little Karroo**, which rises through the Zwarte Bergen to the **Great Karroo**, about twice as wide. This rises again on the north to the **High Veldt**, which is part of the central plateau of South Africa.

The **Congo Basin**, entirely surrounded by highlands, is the largest area of relatively low ground in Africa, but nearly the whole of it is more than 600 feet above the sea. It is supposed to be the floor of an old inland sea.

At the head of the Bight of Biafra the extinct volcanic **Kamerun Peak**, the highest mountain in west Africa (except the Atlas), rises close to the sea to about 13,000 feet.

RIVERS.

436. Nearly the whole of Africa drains to the Atlantic basin. Only two rivers of any consequence, the Zambesi and Limpopo, flow to the Indian Ocean. The **main divide** of the continent runs from the Isthmus of Suez, parallel to the Red Sea, through eastern Abyssinia, and nearly due south to about 10° S. It then passes between Lakes Tanganyika and Nyasa, and runs westward more than halfway across the continent. Just south of the tropic the watershed turns again to the east and lies along the Drakensberg Mountains and the southern edge of the High Veldt.

437. (1) The **Nile**, one of the longest rivers in the world (about 4,000 miles), flows out of Victoria Nyanza over two falls (Ripon and Murchison) to Albert Nyanza, which receives the **Semliki** River from Albert Edward Nyanza. From about 7° to 10° N. the Nile flows in several channels through a great swampy mass of decaying vegetation (*sudd*), some of which has been cut out at great cost to keep a channel open for navigation. From the west of this region the Nile receives its only important left-bank tributary, the **Bahr-el-Ghazal**, which is also much obstructed by *sudd*.

The basin of the Nile is widest (about 1,100 miles) from about 10° to 15° N., where it stretches from eastern Abyssinia to Darfur. The basin gradually narrows to Cairo, from which the delta spreads out fanwise.

Below **Khartum** the actual valley of the river, bordered by steep bluffs, is never more than 30 miles wide, and often less than 10. From Khartum to the mouth the valley is **completely isolated by desert**, but in the south-west the forests of the Bahr-el-Ghazal are continuous with those of the Congo.

The **Blue Nile**, from Lake Tsana in Abyssinia, flows north-west to join the **White Nile** at Khartum. It is a turbulent muddy river, much less constant in volume than the White Nile, owing to the fact that the rainy season of Abyssinia is shorter than that of the equatorial region. The Blue Nile is a small river in winter, and a very large one in summer and autumn.

Below Khartum the Nile only receives one permanent tributary, the **Atbara**, also from Abyssinia. Though almost dry in spring, it is a large river from July to October, bringing down much fertile mud to Egypt.

Between Khartum and Aswan the navigation of the Nile is much impeded by **rapids**—the so-called "**cataracts**"—where the river breaks through barriers of hard rock. There are six **cataracts**, with a total length of about 350 miles. They can be navigated in flood time by flat-bottomed boats and specially constructed steamers of light draught.

438. The **Nile Flood**, on which the prosperity of Egypt wholly depends, is principally due to the Blue Nile and the Atbara, the White Nile being fairly constant in volume.

The Nile of Egypt is at its lowest in May and June. It begins to rise about the middle of July, and reaches its greatest height at Aswan early in September, but at Cairo the maximum does not occur till the beginning of October. The average rise of the water is about 24 feet. An exceptionally low Nile (20 feet) generally means agricultural distress in Egypt, and an exceptionally high Nile (28 feet) causes damage to embankments.

Irrigation in Egypt is carried on in two distinct ways: (1) **basin** irrigation, by flooding the land for about six weeks; (2) **perennial** irrigation, by means of a network of canals and ditches. The latter method is obviously preferable when it can be carried out, as it enables cultivation to be carried on all the year round, while under basin irrigation only winter crops can be grown. Basin irrigation is the rule in Upper Egypt from Aswan to Assiut, and perennial irrigation from Assiut downwards.

The first attempt to control the Nile was the "**Barrage**," a dam just below Cairo, from which three main canals and a multitude of distributaries lead across the delta. More recently a great dam has been built at **Aswan**, to hold back some of the flood water, and so increase the winter supply of lower Egypt. The dam practically converts the Nile for 200 miles up into a huge reservoir. Similar regulating works are in progress at Assiut.

439. (2) The **Futa Jallon** Plateau in French Guinea, though of no great height (about 2,000 feet), is the chief watershed of western Africa, giving rise to the Niger, Senegal, Gambia, and numerous smaller rivers. The **Senegal** and **Gambia** flow westward in nearly parallel courses over a coast plain which is wider than anywhere else in Africa except Tripoli.

The much longer and greater **Niger** (2,300 miles), the **second river** of the continent in volume, flows north-east and then south-west into a large swampy delta which divides the Gulf of Guinea into two parts, the Bight of Benin and the Bight of Biafra. The chief tributary of the Niger is the **Benue**, from the highlands south of Lake Chad.

The Niger is **navigable** by small steamers to **Rabba,** about 400 miles from the mouth. From there up to the **Fafa Rapids**, about 16° N., the course of the river is much broken by Rapids, but the upper Niger is **navigable** for several hundred miles by large canoes or small steamers.

440. (3) The **Congo** (3,000 miles), which probably discharges as much water as all other African rivers put together, is known in its upper course as the Lualaba, which rises in the central plateau about 12° S., and flows nearly due north to the equator, receiving on the right the **Luapula** from Lake Bangweolo, and the intermittent **Lukuga** from Tanganyika.

Just north of the equator the river leaves the plateau at **Stanley Falls**, and flows west and then south-west across the lower basin. From Stanley Falls to Stanley Pool, a distance of about 1,000 miles, the river is **navigable** without interruption, but between Stanley Pool and the mouth it breaks through the western margin of the tableland in a deep gorge with many rapids and falls.

The chief tributaries, the **Kasai** and the **Ubangi,** also have falls where they leave the plateau and enter the flat basin of the middle Congo, *i.e.* about 6° S. and 4° N.

441. (4) The **Zambesi** (1,800 miles) rises near the Lualaba, and flows at first south, forming the boundary between Rhodesia and Portuguese West Africa. It then turns east, and about the middle of its course rushes over the famous **Victoria Falls**, one of the greatest waterfalls in the world, into a narrow zig-zag defile. The course of the lower river is much broken by rapids till, at about 33° E., it makes its final turn to the south-east.

Thus the Zambesi acts as a barrier between north and south rather than as a connexion between east and west. The chief tributaries are on the left bank—the **Loangwa** and the **Shiré**. The latter, which is only navigable by small boats, flows into the head of the delta from Lake Nyasa.

(5) The only other large river of the east of Africa is the **Limpopo** or Crocodile River, which rises near Pretoria and

flows roughly in a semicircle, forming for a long distance the northern boundary of the Transvaal. It is not navigable.

(6) The **Orange** River rises in the Basuto Highlands, and flows west, forming, except in the middle part of its course, the northern boundary of Cape Colony. It varies greatly in depth with the seasons, but is never navigable, and, like other South African rivers, is more a barrier than a route. Its chief tributary, the **Vaal**, is the boundary between the Orange River Colony and the Transvaal.

Inland Drainage.

442. (7) Lake **Chad**, at which three powers meet (France, Britain, and Germany), is the centre of the inland drainage of the deserts of north Africa, and Lake **Ngami** is the drainage centre of the deserts of South Africa (Kalahari and Bechuanaland). There are no permanent rivers in either region, except the **Shari**, flowing from the south into Lake Chad.

CLIMATE.

Temperature.

443. In the northern winter (January) Algeria, as one would expect, is the coolest part of Africa, having an average temperature below 50°. There are **two centres of maximum heat** (85° or more), one in the Congo basin and the other in the south-west (Kalahari Desert). The relative coolness of the west coast has been already explained (§§ 55, 57).

In the northern summer the centre of **maximum heat** (90° or more) covers nearly the whole Sahara and the upper Nile. The temperature diminishes fairly uniformly towards the south, being of course lower on the west than the east. Cape Town has an average winter temperature of about 55°.

Equatorial Africa varies very little in temperature at any time of the year, and the coasts are fairly equable.

But the interior both in the north and south has a considerable range of temperature.

The winter in the north of the Sahara is quite cool and pleasant, and winter resorts there are growing in popularity on account of the extreme dryness of the air.

Winds and Rain.

444. In the **northern winter** (Dec.-Feb.) the heaviest rainfall is in Central Africa from 0° to 10° S., where the centre of lowest pressure is. This part of Africa receives both south-east **trade winds** from the Indian Ocean and **monsoons** from the Arabian Sea. The extreme north receives some rain from the Mediterranean, but the whole belt of the Sahara from the Atlantic to the Red Sea as far south as Lake Chad is rainless.

At the same time the coast of Guinea, as far south as the Congo, gets a moderate rainfall from the prevailing south-east winds, drawn in by the lower pressure on the land. In South Africa, Natal, the east of Cape Colony, and the Transvaal have their wet season, but the west from Cape Town to the tropic is dry, the winds being off-shore.

In the **northern summer** there is a centre of high pressure over the cool southern plateau in Cape Colony and the Transvaal. This diminishes the force of the trade winds, and gives a dry season in Natal and along the east coast generally as far north as the equator. South-west Africa is now almost rainless, except for a small district round Cape Town, which at this season just comes within the zone of westerly winds, and therefore has a wet (winter) season, like the Mediterranean countries.

The zone of heaviest rainfall has now moved north with the sun, and lies in July along the coast of Guinea and in the lower Niger basin. The whole continent from 0° to 15° N. has a fairly heavy summer rainfall (least in Somaliland), but north of 20° there is virtually no rain, owing to the intense heat and the dryness of the north-east winds.

The equatorial belt has no really dry season, but two distinct wet seasons (about March and September) with two less wet seasons between them.

VEGETATION AND ANIMALS.

445. North of the Atlas Mountains the country has a closer resemblance to southern Europe than to any other part of Africa. The Tell region (§ 431) contains forests of **oak** and gardens of **olive** and **vine,** while wheat, barley, and maize are also grown.

South of the Atlas is a belt of **steppe,** growing poor pasture and **alfa,** or **esparto grass,** merging gradually into the great desert, where there is hardly any vegetation at all except in the oases.

The chief **oases** are those of **Tafilet** and **Tuat,** south of Morocco, and of Murzuk in the Fezzan, south of Tripoli. The characteristic plant is the **date-palm,** but cereals are cultivated in some of the larger oases.

446. On the southern margin of the desert, about the latitude of Lake Chad, where there is a short rainy season in the summer, the desert passes again into **steppe,** with dry grass and bushes; and, as the rainfall increases nearer the equator, the steppes change into the open park-like forests, interspersed with grass land, which cover most of Central Africa as far as 20° S., and also the eastern slope to the extreme south. The characteristic tree of this **savanna** region is the **baobab.**

Dense **tropical jungle** occurs (1) along the coast of Guinea from the mouth of the Gambia to that of the Ogowe in French Congo, (2) in nearly the whole basin of the Congo, extending to the west bank of the upper Nile, (3) on the western slope of Abyssinia, (4) on the east coast from the equator to the mouth of the Zambesi, and along the lower course of that river. The **mangrove** is a characteristic tree of the very unhealthy coast swamps.

South of Lat. 20° S. the interior consists principally of **steppes,** growing **thorny bushes** (acacia, etc.) and poor grass, but very fertile when irrigated. Near the west coast, from Cape Frio to the Orange River, is a strip of absolute desert, more sterile than the **Kalahari** Desert, which is not quite devoid of vegetation.

447. Egypt is the only part of Africa which maintains a dense agricultural population. The most important crop in lower Egypt is **cotton**, in Upper Egypt **sugar**, but large crops of rice, clover, beans, and cereals are also grown. Wheat is often grown in winter, and maize in autumn, on the same land which in summer produces cotton, rice, or other sub-tropical plants. This of course is only possible in the area of perennial irrigation.

Outside Egypt and the French Mediterranean states, the chief plants of economic importance are **date-palms** in the Sahara and northern Sudan, **oil-palms** and gums in Guinea and the central Sudan, **rubber** in the Congo basin and Portuguese East Africa, maize and sugar in Natal and Zululand. The vine grows only in the extreme north and south. Apart from minerals, the chief wealth of South Africa lies in its **sheep** and **ostriches**. It is the third greatest wool-exporting region in the world, being surpassed only by Australia and Argentina.

MINERALS.

448. The chief minerals raised in Africa up to the present are **gold** and **diamonds**. One of the most important gold-fields in the world lies in the Transvaal on a ridge about 50 miles long, called **Witwatersrand**, or simply the "Rand." It lies principally to the west of **Johannesburg**, which owing to gold has grown in less than a quarter of a century from a village into the largest town in South Africa.

The gold is found in fragments of **quartz** imbedded in sand or clay, and occurs with such remarkable uniformity throughout the Rand that gold-mining ceases to be a speculation, and becomes a steady business, the only drawback to which is the difficulty of obtaining cheap unskilled labour.

449. Kimberley, in Griqualand West, on the border of the Orange River Colony, owes its foundation and growth entirely to the rich diamond **mines** covering an area some 10 miles square around it.

Alluvial or river gold is found in the east of the Transvaal at **Barberton**, and in several parts of **Rhodesia**. The remarkable vast ruins of old fortified cities, found at Zimbabwe and other places in Mashonaland, indicate that gold was largely worked there at some long-past period—by whom is unknown. River gold is still exported to a small extent from the British colony of the **Gold Coast** in Guinea.

Copper ore is found in large quantities at **Ookiep**, in the north-west of Cape Colony, and is taken by rail to Port Nolloth for export. The most important **coal-field** in Africa at present is in northern Natal, round Newcastle and Dundee. **Iron ore** is found in the same region, but the iron industry is as yet in its infancy.

POPULATION.

450. North Africa, about as far south as Lat. 15° N., is mainly inhabited by people of the white (Caucasic) race. There are two chief subdivisions of this race in Africa: (1) the **Hamites**, who include the Berbers of Morocco, Algeria, and Tunis (the "Barbary" States), the Tuaregs of the Sahara, the Egyptians, and the Gallas and Somalis of the eastern "horn" of Africa. (2) The **Semites**, including the Arabs, who are thinly scattered over all North Africa and are the chief slave-traders; and the Abyssinians.

Africa south of the Sahara is preeminently the home of the **negro** or **Ethiopic** race, of which there are also two main subdivisions, distinguished more by differences of language than by physical characteristics.

(1) The **Sudan** negroes inhabit the country extending from Senegal and Sierra Leone to the upper Nile. The **Hausas** and **Yorubas** of the Niger basin appear to be the ablest and most progressive tribes, and had formed strong states with some degree of civilisation before coming into contact with Europeans.

(2) The **Bantu** negroes occupy all Central and South Africa except the south-west, into which they have pushed two aboriginal races of lighter colour, smaller stature, and lower organisation—the **Hottentots** and **Bushmen**. The most important branches of the Bantu race are the Zulus, Basutos, Bechuanas, Matabeles, and Mashonas, all called "Kaffirs" by the white people of South Africa.

Of modern immigrants into Africa the chief are **British**, **Dutch**, and French (Huguenots) in South Africa; **French** in Algeria and Tunis; Turks, Greeks, Italians, and English in Egypt. Even in the countries above named Europeans are everywhere largely outnumbered by the native races, and in all the rest of Africa the only Europeans are isolated administrators, traders, or missionaries.

451. The only densely populated part of the continent is **Egypt**, the cultivated parts of which (about 12,000 square miles) support about 10 million people—more than one-twentieth of the population of the continent on about one-thousandth of the area. Elsewhere it is only in the basins of the Lower Niger and Benûe that the population is as much as 50 to the square mile over any considerable area. The population of the Sahara is less than one to the square mile.

POLITICAL DIVISIONS.

452. The only considerable states in Africa not definitely under European control are **Morocco**, **Abyssinia**, and the negro republic of **Liberia**, founded by freed slaves from America. The first of these states is in the **French** "sphere of influence." **Italy** attempted to establish an ascendancy over Abyssinia, but was crushingly defeated at Adowa in 1896, and now possesses only the east of **Somaliland** and the coast strip of **Eritrea** on the Red Sea.

453. French Territory in Africa includes **Algeria** and **Tunis**, nearly the whole of the **Sahara** (except the Spanish protectorate of the Rio de Oro in the west), and the basins of the Senegal and the upper Niger, together with **Dahomey** and the **Ivory Coast** in Guinea, French Congo, and part of Somaliland, including the port of **Jibouti**, from which a short railway runs into Abyssinia.

The lower Niger basin and the country to the north-east of it as far as Lake Chad compose the **British** colony of

Nigeria, and on the Guinea coast Britain also possesses **Ashanti** and the **Gold Coast, Sierra Leone**, and the lower valley of the Gambia.

454. German Africa includes **Togoland** (between Ashanti and Dahomey), **Kamerun**, from the Bight of Biafra to Lake Chad, the deserts of **Damaraland** and **Namaqualand** in the south-west, and **German East Africa**, from the Indian Ocean to Lake Tanganyika.

The island of **Zanzibar**, however, the chief trading centre of tropical East Africa, is a **British** protectorate. **British East Africa**, between the German colony and Abyssinia, extends inland to the Nile, and is continuous with the Anglo-Egyptian Sudan.

The **Congo Free State** is at present under the control of the King of the Belgians, but is likely soon to become a Belgian colony. It includes approximately the whole basin of the Congo east of the Ubangi, which separates it from French Congo.

Portuguese Africa consists of two large areas, **Angola** on the west, south of the Congo basin, and **Portuguese East Africa**, extending from Cape Delgado to Zululand, and including the lower courses of the Zambesi and Limpopo.

The rest of Central and South Africa is occupied by the British colonies or protectorates of the **Cape of Good Hope, Natal**, the **Orange River**, the **Transvaal**, Bechuanaland, British Central Africa, and **Rhodesia**—the last an immense undeveloped territory administered by the British South Africa Company, and extending from the north of the Transvaal to the south of Lake Tanganyika.

455. Many political **boundaries** in Africa are purely **artificial** in character, often merely following lines of latitude or longitude. This arises from the absence of strong native states and the fact that the present boundaries are the result of a number of treaties between the European powers, mostly made during the last quarter of the nineteenth century, and that boundaries were often agreed on before there had been any detailed exploration of the country under consideration.

The government of **Egypt** is very anomalous. The country is nominally under the **suzerainty of Turkey**, and its laws and decrees are issued in the name of the native ruler, the Khedive; but almost all real power is in the hands of the British Minister at Cairo, acting under the home government. From Wadi Halfa to Fashoda the status of England is officially recognised, this part of the Sudan being known as the "**Anglo-Egyptian Condominium.**" Practically the whole Nile valley (except the Abyssinian part of the Blue Nile) is a British protectorate.

RAILWAYS.

456. Only in the Nile valley and in British South Africa are there as yet any extensive railway systems in Africa, but railway construction is progressing rapidly. The **Nile** railway follows the river from the delta to **Khartum**, except where it crosses the desert between **Wadi Halfa** (the old frontier town of Egypt, at the foot of the second cataract) and Abu Hammed.

From **Berber**, just below the confluence of the Atbara, a newer line runs across the desert to **Suakin** and Port Sudan on the Red Sea, thus providing the Sudan with a nearer outlet to the sea than the mouth of the Nile.

The so-called "**Cape to Cairo**" railway now extends from Cape Town to beyond the Zambesi, which it crosses at the **Victoria Falls**; it will probably be continued to Tanganyika, but there is no immediate prospect of the completion of a through route between North and South Africa.

The main line runs through **Kimberley, Mafeking, Bulawayo** (capital of Matabeleland), and the Wankie coal-field just south of the Zambesi. From Bulawayo a branch runs through **Salisbury** (the capital of Rhodesia) to the port of **Beira** in Portuguese East Africa.

All the other railways of South Africa are to the east and south of the lines just mentioned. Two lines from **Port Elizabeth** and **East London** converge at **Springfontein**, and run through **Bloemfontein, Johannesburg**, and **Pretoria** to **Pietersburg** in the north of the Transvaal.

From Pretoria a line runs nearly due east through the Barberton gold-field to the Portuguese town of **Lorenço Marquez** on Delagoa Bay. Another line from **Johannesburg** crosses the Drakensberg at Laing's Nek, and runs through the coal-field of Natal to the port of **Durban.**

The **Uganda** Railway runs from **Mombasa**, the port and capital of British East Africa, to **Port Victoria** on the north shore of Victoria Nyanza. A line is in course of construction from **Dar-es-Salaam,** the chief port of German East Africa, to **Ujiji** on Lake Tanganyika. A railway now runs up the **Shiré** valley from **Chinde,** the port of the

Zambesi delta, to Blantyre in the Shiré Highlands, a growing centre of coffee plantations.

In the **Congo** valley a railway runs from Matadi to **Leopoldville** on Stanley Pool, thus avoiding the rapids, and providing quick transit to the navigation of the upper river.

The French have joined the upper Senegal by railway to the upper Niger, so that it is possible to go by rail and steamer to **Timbuktu**, which was till recently one of the most inaccessible towns in Africa.

From **Lagos** a railway is being constructed northwards through the **Yoruba** country to the Niger. There is a considerable railway system in the French Mediterranean colonies, linking **Oran** with **Algiers** and **Tunis**, and several branches run inland to the edge of the desert.

NOTE.—Most of the commerce (not as yet very important) of Central Africa is still carried along narrow footpaths on men's heads or backs, as the fatal tsetse fly makes large areas uninhabitable by horses or oxen. The only road of any length fit for wheels is the **Stevenson Road**, joining Lakes Nyasa and Tanganyika. In North Africa the camel is the usual beast of burden, and in South Africa the ox.

REGIONS AND TOWNS.

457. Cairo, the capital of Egypt and the largest town in Africa, is situated at the head of the delta, and therefore controls routes both up the Nile valley and eastward across the desert to the Isthmus of Suez, Syria, and Mesopotamia.

The chief ports of Egypt are **Alexandria**, west of the delta, on a bar between the sea and Lake Mareotis, and **Port Said**, at the north end of the Suez Canal. Alexandria, founded by Alexander the Great, has long been the chief port of the eastern Mediterranean, but Port Said, now a great coaling station, owes all its importance to the canal.

Aswan has an important position as the head of the unimpeded navigation of the Nile, and more recently as the site of the great dam which has so greatly increased the prosperity of Lower Egypt. **Khartum**, in the angle between the Blue and White Nile, is the natural centre for the control of the upper Nile, and is the seat of government of the Anglo-Egyptian Sudan.

Tripoli, the capital of the Turkish province of the same name, is the terminus of several caravan routes from the

Sahara, and exports ivory, dates, ostrich feathers, and alfa. **Tunis**, near ancient Carthage, is the outlet of the fertile valley of the River Majerda, and is the largest town in French Africa. It was made a seaport in 1893 by the construction of a short canal. **Bizerta**, situated on a natural harbour a few miles to the north, has been made a strong naval fortress, and has a strategic position comparable with that of Malta.

The chief towns and ports of Algeria are **Algiers**, the capital, a favourite winter resort, and **Oran**, further west. **Tangiers**, the chief port of Morocco, is, owing to the weak government and the fanatical hostility of the people to foreigners, the only town in that country in which Europeans can safely reside. **Ceuta** is a Spanish fortress opposite Gibraltar.

On the southern edge of the Sahara many **caravan** routes converge on **Timbuktu**, which stands near the upper Niger at a point from which the river is navigable in both directions for a considerable distance.

Kano, in Northern Nigeria, half way between the Niger and Lake Chad, is possibly, after Cairo, the most populous inland town in Africa. It is the centre of a well-cultivated region producing maize, durrha (a kind of millet), and cotton. There are manufactures of cotton and leather, and a considerable caravan trade across the Sahara.

There are many small ports in Guinea, few possessing good harbours, and all in unhealthy situations. The most important is **Lagos**, on the Bight of Benin, built, like Alexandria, on a bar in front of a lagoon. Other ports are **Akasa** and **Bonny** on the Niger delta, **Victoria** in Kamerun, **Akra** and **Cape Coast Castle** on the Gold Coast, **Freetown** in Sierra Leone, **Bathurst** at the mouth of the Gambia, **Dakar** in the bay south of Cape Verd, and **St. Louis** at the mouth of the Senegal. In central West Africa the chief ports are **Boma** on the Congo, about 50 miles from the mouth, and **Loanda**, **Benguela**, and **Mossamedes** in Angola.

458. Cape Town, the capital of Cape Colony, owes its importance to its position on a sheltered bay facing north (*i.e.* towards Europe) and to the fact that it was the first European settlement in South Africa, rather than to any general geographical advantages. The land immediately surrounding it is fertile, and the climate is good, but the town is separated by a long stretch of dry veldt from the richer pastoral regions further east, which lie in the hinterland of **Port Elizabeth**, **Port Alfred**, and **East London**.

These three towns export nearly all the South African **wool**. Cape Town itself exports much of the **gold** of the Transvaal, the **diamonds** of Kimberley, and the **ostrich feathers** of the western Karroo. The chief town and port of Natal is **Durban**, which is also to some extent a port for the Transvaal.

The chief ports of tropical East Africa have been mentioned in connexion with railways.

THE SUEZ CANAL.

459. The **Suez Canal**, opened in 1869 is beyond question the most important canal in the world, as it provides a **short sea route** between the most populous parts of Europe and of Asia, which on land are separated by large areas of barren, mountainous, and sparsely inhabited country.

The canal shortened the voyage from Western Europe to India and China by about 4,000 miles, or about 10 days. To Australia and New Zealand the saving is less—1,200 to 1,600 miles—and many vessels still go to those countries by the Cape route, to avoid canal dues.

The canal is 87 miles long, of which 66 miles are artificial and 21 miles consist of lakes. On the average about twelve large vessels a day pass through the canal, which will take ships drawing 26 feet of water. Three-fifths of the total tonnage is British.

The Suez Canal is by international agreement open to ships of all nations both in peace and war, but the fact that the canal is entirely in Egyptian territory is one of the chief reasons for the continuance of the British occupation of Egypt.

AFRICAN ISLANDS.

460. Africa, like South America, has **very few islands** near it, and, except **Madagascar**, they are all of small size and of volcanic origin.

Atlantic Islands.

The **Azores** are about 750 miles west of Portugal, to which they belong. They export cattle, dairy products, and fruit, especially oranges and pineapples. The **Madeira** Isles, west of Morocco, also belong to Portugal, and on account of their splendid climate are much visited by invalids. Wine and fruit are the chief productions. The capital is **Funchal**.

The **Canary** Islands, considerably nearer the mainland, are almost the sole important remnant of the once enormous colonial possessions of Spain. The Peak of Teneriffe rises to over 12,000 feet. The chief towns are **Santa Cruz**, in Teneriffe, the capital, and **Las Palmas**, in Gran Canaria, a coaling-station. Wine and cereals are produced.

The **Cape Verd** Islands, south of the tropic, are Portuguese, and produce coffee, cereals, and sugar. **St. Vincent** is used as a coaling-station on account of its excellent harbour.

The unproductive islands of **St. Helena** and **Ascension** are British. The former was an important calling place in the days of sailing ships carried north by the trade wind, but its importance has declined owing to steam navigation, and above all on account of the Suez Canal. St. Helena and Ascension are on the line of the main submarine cable from Cape Town, which is continued through Cape Verd Islands, the Canaries, and Madeira to England.

Tristan da Cunha, on the northern limit of icebergs, is almost uninhabited, and has no regular communications with the rest of the world.

In the Bight of Biafra are four island peaks lying in a straight line south-west of the peak of Kamerun. They are **Fernando Po**, Principe, São Thomé, and Annobon, of which the first and last are Spanish and the other two Portuguese. **São Thomé** is well cultivated, and produces cacao, coffee, and cinchona.

461. Madagascar, one of the largest islands in the world (nearly twice the area of the British Isles), is a **French** colony separated from Africa by the very deep Mozambique Channel, about 250 miles wide at the narrowest. A

plateau about 4,000 to 5,000 feet high, occupying about half the island, runs from north to south, with a very narrow coast plain on the east and a wide one on the west. The east coast is remarkably straight.

Lying entirely in the southern trade wind belt, Madagascar is always wet on the east and dry on the west. There is little seasonal variation either of rainfall or temperature.

A belt of dense **forest**, containing valuable timber, surrounds the whole island. The high interior is mostly open grassland.

The chief occupations are **cattle-breeding** on the uplands, and the production of **rubber, rice, sugar**, and other tropical plants on the lowlands. The capital, **Antananarivo**, is near the middle of the island; the chief port is **Tamatave**, on the east coast.

Madagascar contains many species of **animals** and **plants** not found elsewhere, showing that the island has been separated from Africa for an immensely long period. The separation is further emphasised by the fact that the natives, called Malagasy, are of Malayan origin. The Hovas are the principal tribe.

462. The small islands to the east and north of Madagascar are mostly **volcanic** islands fringed with **coral** reefs. The most important are **Mauritius** (British) and **Réunion** (French), both of which are chiefly devoted to the cultivation of **sugar**. The **Seychelle** Islands (British), near the equator, produce cocoa-nuts and cocoa-nut oil.

The situation of **Mauritius**, about half way between the Cape and India, is one of strategic importance, comparable with that of Bermuda in the North Atlantic. When in possession of the French, during the eighteenth century, the island served as an advanced base for expeditions to India.

CHAPTER XVIII.

ASIA.

GENERAL.

463. Separated from Europe by the Ural Mountains and River, and the River Manych, Asia is elsewhere defined by the sea. Its **area** is over seventeen million square miles, or nearly one-third of the land area of the world.

The continent extends from Cape Romania, at the **south** of the Malay Peninsula, only about 1° north of the equator, to Cape Chelyuskin, at the **north** of the Taimyr Peninsula, more than 10° north of the Arctic Circle; and from Cape Baba, in the **west** of Asia Minor, through more than 160° of longitude, to **East** Cape on Bering Strait.

This shallow strait is less than 40 miles wide, and there was probably a land connection between Asia and America in times not geologically remote.

In spite of its great peninsulas Asia is on the whole so **compact a land mass** that in the centre of it an area larger than Great Britain is more than 1,500 miles from the sea, while in the other continents only small areas of North America and Africa are as much as 1,000 miles from the sea.

COASTS AND SEAS.

464. The **north coast**, lying wholly, except in the extreme east, within the Arctic Circle, is generally low, except where the mountains of the Taimyr Peninsula project northward. West of this peninsula the coast is much indented, and the rivers form long estuaries, while on the east of the peninsula they form deltas.

The **east coast** of Asia is much indented. There are in reality two east coasts, as an **almost continuous fringe** of volcanic islands lies in a series of loops east of the mainland. The seas enclosed by these islands, except the Sea of Japan, are mostly shallow, but on the outer side of the islands the sea floor falls steeply to abysmal depths.

In the north-east the mountainous peninsula of **Kamchatka** projects nearly due south, and is continued in the line of the **Kurile** Islands, which, with the island of **Sakhalin**, enclose the Sea of Okhotsk. Sakhalin and the Kuriles converge on the islands of **Japan**, which, with the mountainous peninsula of Korea, enclose the Sea of **Japan.**

South of Japan are the **Luchu** Islands and **Formosa,** enclosing the **East China Sea**. The northern part of this, between Korea and the mainland, is called the **Yellow Sea,** from the colour of the silt brought down by the Yellow River (Hwang Ho).

The Yellow Sea is the antechamber of the Gulf of **Pechili,** from which it is nearly separated by the rocky peninsula of Shantung. The **South China Sea** (with the Gulf of **Tongking** corresponding to the Gulf of Pechili) is enclosed by the **Philippine Islands** and **Borneo.**

In the south-east of Asia is the large peninsula of **Indo-China,** from the west of which the long narrow **Malay** Peninsula extends nearly to the equator. The Isthmus of **Kra,** in the middle of the Malay Peninsula, is less than 50 miles wide.

The triangular peninsula of **India** and the rectangular peninsula of **Arabia** project southward into the Indian Ocean. Both are terraced table-lands, rising steeply from narrow coast plains, which below sea-level descend with equal steepness to great depths, except in the **Persian Gulf,** which is shallow and silting up.

Arabia is separated from Africa by the deep trough of the **Red Sea,** which divides at its head into the Gulfs of **Suez** and **Akabah,** with the rocky peninsula of Sinai between them.

The coasts of **Asia Minor** and of **Syria** (except for the small plains of Sharon and Philistia in Palestine) are bordered by mountains within a few miles of the sea. In fact, on all the coasts of Asia except the north, there are no extensive coast plains except the deltas of the great rivers, and the plain of North China.

CONFIGURATION.

465. Asia, like Europe, consists broadly of a **northern plain** (Siberia) and a complex system of central and southern **highlands**, consisting partly of folded mountain ranges and partly of lofty plateaus. Asia, however, differs markedly from Europe in the possession of a very large area of **inland drainage**, which is mostly desert.

The Northern Plain.

466. The Northern Plain is widest in the west, where it extends from the Arctic Ocean to the south of the Caspian Sea. The southern part of the plain has no outlet to the sea. It drains partly to the **Caspian**, but more to the **Aral** Sea, by the rivers **Amu-daria** (Oxus) (1,300 m.) and **Syr-daria** (Jaxartes) (1,100 m.), flowing respectively from the Pamir Plateau and the Tian Shan Mountains.

Further north the river **Ili**, also from the Tian Shan, flows to Lake **Balkhash**. All the lakes of this region (including the so-called "seas") are very **salt**, and are diminishing in size.

The Arctic slope of the plain is drained chiefly by three great rivers, all of which, like the northern rivers of Europe, receive their chief tributaries from the right.

(1) The **Irtish** (2,500 m.) rises on the southern slope of the Altai Mountains, and at Tobolsk receives the Tobol from the south of the Ural Mountains. Lower down, the largest tributary, the **Ob** (2,000 m.), flows in, also from the Altai Mountains, and gives its name to the lower river.

(2) The **Yenisei** (3,000 m.) has a course nearly parallel to that of the Irtish. Its chief tributary, the Upper Tunguska, flows out of Lake **Baikal**, the largest fresh-water lake in Asia.

(3) The **Lena** (2,500 m.) rises close to the west side of Lake Baikal, and flows nearly due east till it receives the Aldan, when it turns north, and reaches the Arctic through a large delta.

The Siberian rivers are among the greatest in the world, and in **summer** are **navigable** for long distances; but commercially they are almost **useless**, as they flow through mostly barren country into a sea always encumbered with ice, and for the greater part of the year quite impassable. Moreover, the upper parts of the rivers melt in spring some time before the lower parts, and frequently cause great floods.

The Central and Southern Highlands.

467. The core of Asia is the **Pamir Plateau,** or "the roof of the world," a "knot" from which many folded mountain ranges diverge east and west. The valleys of the **Pamir** region are about 11,000 feet high, and there are several ridges a few thousand feet higher, running east and west.

Most of the region is in **Russian Turkestan,** but four powers meet on the borders of the Pamirs—the Indian, Russian, and Chinese Empires, and the small mountain kingdom of Afghanistan.

468. North-east of the Pamirs lie the **Tian Shan** Mountains, and beyond them the **Altai, Yablonoi,** and **Stanovoi** Mountains, the whole series forming the steep southern edge of the Siberian Plain.

South of the Tian Shan ranges, parts of which are 24,000 feet in height, lies the basin of Eastern Turkestan, known as the **Taklamakan Desert,** drained by the River **Tarim,** flowing from the Pamir Plateau into the salt lake of **Lob Nor.** The ruins of cities, sometimes buried in sand, indicate that this now uninhabited and little known region was once capable of supporting a numerous population.

Further east, south of the Altai and Yablonoi Mountains, lies the great plateau of **Mongolia,** consisting mostly of the **Desert of Gobi** or Shamo. On its eastern edge are the mountains of Khingan and Shansi, overlooking the plains of Manchuria and northern China.

The **Kwenlun** range, which has peaks of over 22,000 feet, runs nearly due east from the Pamirs, separating the basins of Taklamakan and Gobi from the **Plateau of Tibet**, the highest inhabited region in the world (12,000 to 15,000 feet).

The shorter range of the **Karakoram** Mountains lies a little further south, separating the upper Indus from the inland drainage area. One of the Karakoram peaks is over 28,000 feet high, and one of the passes (18,500 feet), leading from Leh, in the Indus valley, to Yarkand, in the basin of the Tarim, is the **highest pass** in the world which is used as a trade-route.

At the eastern edge of the Tibetan Plateau several ridges run southward, forming with the long valleys between them the peninsula of **Indo-China** and its southern extension, the **Malay Peninsula.**

469. Along the southern edge of the Tibetan Plateau the upper **Indus** and the **Brahmaputra**, rising within a few miles of each other, flow in deep valleys in opposite directions. Immediately to the south of them, forming a wide curve convex to the south, rises the loftiest mountain range in the world, the **Himalayas**, which in Nepal culminate in **Mount Everest** (29,000 feet), **Godwin-Austen** (28,250 feet), **Kánchanjangá** (28,200 feet), and several other peaks over 26,000 feet.

To the south the Himalayas descend very steeply, almost to sea-level, in the Plain of the **Ganges**. The passes of the Himalayas are mostly higher than the highest peaks of the Alps.

Peninsular India.

470. South of the Indus-Ganges lowland, the peninsula of **India** is bounded on the north by the Tropic of Cancer. It consists of a triangular plateau, which is steep and high on the west, where the coast plain and the continental shelf are both narrow, but slopes gradually to a wider plain on the east.

The Ganges plain gradually rises on the south to the **Aravalli** Hills and the **Vindhya** Range. South of this the **Narbada** River (800 m.) flows westward to the Gulf of Cambay in a deep narrow valley, separated by the **Satpura** Range from the parallel **Tapti** River.

South of the Tapti is the plateau called the **Deccan**, which consists principally of an old lava flow which has weathered into a fertile black soil. The steep western edge of the Deccan is known as the **Western Ghats**, and extends in an unbroken line (crossed by only two railways) from the Tapti gorge to the **Nilgiri** Hills, making the interior very difficult of access from the west. The other side of the peninsula is a much lower and less continuous line of heights known as the **Eastern Ghats**.

South of the Nilgiri Hills is a remarkable depression called the **Palghat Gap**, through which the railway runs from Calicut to Madras. South of this gap the range of the **Cardamom** Mountains extends to Cape Comorin, at the extreme south of the peninsula.

Ceylon.

471. Ceylon is lowland in the north, and mountainous in the centre and south. It is essentially a **continental** island, **Palk Strait**, which separates it from India, being too shallow for navigation by large ships. India is, in fact, nearly joined to Ceylon by two small islands with a coral reef, named **Adam's Bridge**, between them. The Gulf of Manaar, south of Adam's Bridge, is famous for its pearl fisheries.

South-Western Asia.

472. To the west and south-west of the Pamirs stretches the lower **Plateau of Iran**, some 800 miles broad, including the greater part of Afghanistan, Persia, and Baluchistan. It is bordered on the east by the **Suliman** Mountains, and on the north by the lofty **Hindu Kush** and the **Elburz** Mountains, the latter forming the steep southern shore of the Caspian Sea.

In the north-west of Iran the highlands narrow to the

Plateau of Armenia, another "knot" where three powers—Russia, Persia, and Turkey—meet at **Mount Ararat** (17,000 feet). The Armenian Plateau is continuous on the west with the lower **table-land** which fills nearly the whole of **Asia Minor**; and is only separated from the **Caucasus Mountains** on the north by the narrow valley of the Kur. The Caucasus lie between the Black Sea and the Caspian, and the highest point is **Elbruz** (18,500 feet), an extinct volcano.

On the south-west Iran is separated from the mountains of **Syria** and from the **Arabian Plateau** by the broad alluvial plain of Mesopotamia—the basin of the Rivers **Tigris** and **Euphrates**.

The coast range of Syria is called **Lebanon** in the north and the Mountains of Judaea in the south. East of the coast range and parallel to it is a very remarkable **rift-valley** in which flow the River Orontes northward to the Mediterranean at Antioch; and the River **Jordan** (250 m.) southward through the Sea of Galilee into the very salt **Dead Sea**, which has no outlet. Between these two lakes the whole course of the Jordan is below sea-level, and the surface of the Dead Sea is nearly 1,300 feet lower than the sea.

The Gulf of **Akabah** is a continuation of the Syrian rift-valley, and the two are connected by a dry valley called Arabah. The range on the east of the rift-valley opposite Lebanon is named **Anti-Lebanon**.

The Red Sea is a much larger and deeper **rift-valley** dividing the plateau of Arabia from that of Nubia.

The Islands.

473. Japan is a group of several hundred islands, of which only four are of importance. These are **Yezo** in the north, **Honshu** (Hondo), the largest island, in the centre, and **Kyushu** and **Shikoku** in the south. The last two, with the main island, enclose the **Inland Sea of Japan**, land-locked except for narrow straits, and surrounded by small but fertile lowlands.

Honshu is almost exactly equal in area to Great Britain, and the four islands together are slightly bigger than the

British Isles. All the islands are **mountainous** and **volcanic**. The highest summit is **Fujisan**, near the middle of the main island, a perfectly symmetrical volcanic cone (not at present active) rising to 12,000 feet. Japan has more frequent earthquakes, great and small, than any other part of the world.

474. The **Malay Archipelago**, or the **East Indies**, is a group including some of the largest islands in the world and innumerable smaller ones, extending from the south-east of Asia to the north-west of Australia.

There is no clear line of division separating Asiatic from Australian islands. **Wallace's Line**, which is based on the distribution of animals and plants, runs from Bali, the small island east of Java, through the Macassar Strait between Borneo and Celebes, and passes south-east of the Philippines. This line was probably once the **coast line of continental Asia**, and strictly speaking the islands to the east of it are more Australian than Asiatic. It is more convenient, however, to consider all the islands together, except **New Guinea**, which is always included in Australasia.

The southern border of the Archipelago is the great chain of the **Sunda Islands** from **Timor** to **Sumatra**, continued in the Bay of Bengal by the Nicobar and Andaman Islands. North of the Sundas lie the great islands of **Borneo** and **Celebes** and the group of the **Moluccas** or Spice Islands; and further north still the **Philippine** Islands, of which Luzon and Mindanao are the largest.

All the islands are **mountainous**. In **Java** and **Sumatra** a high ridge runs along the outer or oceanic coast, while a broad lowland faces the Java Sea and the Strait of Malacca. In **Borneo** and **Celebes** the mountains radiate from the centre, enclosing coast plains in Borneo and long gulfs in Celebes. The latter rises from deep water, while Borneo, as well as Java and Sumatra, are on the **continental shelf**.

Nearly all the Malaysian islands except Borneo are intensely **volcanic**. A great semicircle of cones, many of which are still active, extends from **Sumatra** to the **Philippines**. The volcanoes of Java eject chiefly mud, not lava.

Krakatoa, a small island in the middle of Sunda Strait, between Java and Sumatra, is famous for an immense volcanic explosion which took place in 1884.

RIVERS.

475. The rivers of the northern plain and of the inland drainage area have been already mentioned. Four rivers of the eastern slope of Asia need mention.

The **Amur** (2,500 m.), formed by the union of two rivers from the Yablonoi Mountains, flows round the north of the Khingan Mountains into the Sea of Okhotsk opposite Sakhalin. The greater part of the river is the boundary between Manchuria and Siberia, but the last 400 miles of it is wholly Siberian. A southern tributary, the **Usuri**, furnishes a southward route to the coast at Vladivostok.

The **Hwang Ho** (Yellow River) (2,500 m.) rises in Eastern Thibet on the north of the Kwenlun Mountains, and flows north-east and then nearly due south through a deep gorge, making a sharp turn to the east on receiving the **Wei.** Just below this bend the narrow valley opens out into the great alluvial plain of North China, across which the river runs to the Gulf of Pechili, in a bed raised above the plain by enormous deposits of silt, and embanked to prevent floods. These, however, occur periodically, causing enormous loss of life; the lower river has changed its course about a dozen times within the historical period, flowing alternately north and south of the Shantung peninsula.

The valleys of the middle Hwang Ho and its tributaries are deeply covered with a deposit of **loess**, a light very porous yellow soil, which is supposed to have been wind-blown from the central plateaus. It is very fertile, and is cultivated up to a height of several thousand feet.

476. The **Yangtse-kiang** (3,000 m.) is the most important river of Eastern Asia. It rises on the south of the Kwenlun, and flows first south-east and then north-east through a sinuous narrow valley. On the left of the middle river is the fertile mountain-rimmed plain of **Sechwan**—the "Red Basin"—drained southward by the **Kialing**, opening to the main river at Chung-King. Between this port and Ichang the Yangtse again flows through a magnificent narrow gorge, and its course is obstructed by rapids.

Below Ichang the river is **navigable** by large steamers to the sea (about 1,000 miles). The valley of the River **Han**, from the Tsinling Mountains on the north, is an important southward route leading into a fertile plain with many lakes. From Nanking to the sea the delta of the Yangtse is continuous with the plain of North China.

The **Sikiang** (900 m.) is the chief river of Southern China. It rises in the Maioling Mountains of Yunnan, and flows nearly due east into the large estuary called the Canton River, which also receives the **Pekiang** from the north and the **Tungkiang** from the east.

477. **Indo-China** and **Burma** are drained by **five** rivers diverging from the south-east of the Tibetan Plateau, and flowing in deep forested valleys, so isolated by high ridges that political control has always been divided in this part of Asia. Each river ends in a deltaic lowland where most of the population is concentrated.

The rivers are, from east to west:—(1) The **Songkoi**, or Red River, of which the delta is the French colony of **Tonking**. (2) The **Mekong** (1,600 m.), forming in its middle course the boundary between Siam and Annam, and then flowing through the delta of Cambodia and Cochin China. (3) The **Menam** (900 m.), which is wholly a Siamese river. (4) and (5) The **Salwin** and the **Irawadi** (800 m.), flowing through the British colony of Burma. The Irawadi is navigable to **Bhamo**, close to the Chinese frontier.

478. The **Ganges** (1,500 m.) flows nearly parallel to the Himalayas in a wide alluvial plain, entering the Bay of Bengal through a large, complicated, densely forested delta called the **Sunderbunds.** This is also the delta of the **Brahmaputra,** which flows along the northern foot of the Himalayas and curves sharply round their end into Assam. The chief tributary of the Ganges is the **Jumna** from the Himalayas, west of the main river. The Jumna receives the **Chambal** from the Vindhya Mountains of Central India.

The **Indus** (1,800 m.) and its chief tributary, the **Sutlej,** both rise north of the Himalayas, within a few miles of the sources of the Brahmaputra and the Gogra (the largest northern tributary of the Ganges). The main river flows round the west end of the range, but the Sutlej breaks through the mountains in a gorge north of Simla.

The middle Indus and the Sutlej enclose between them the **Panjab,** or Land of Five Rivers (Jehlam, Chenab, Ravi, Beas, and Sutlej). The plains of the Indus and the Ganges form a continuous belt of lowland across continental India.

The **Deccan** plateau is drained almost wholly to the east, the rivers having cut back their valleys almost to the Western Ghats. The largest rivers are the Mahanadi (500 m.), Godavari (900 m.), Krishna (800 m.), and Kavari (Cauvery) (450 m.), all forming considerable deltas and much used for irrigation.

South-Western Asia contains no large rivers except the **Tigris** (1,100 m.) and **Euphrates** (1,700 m.), flowing from the Armenian Plateau, and uniting a little above the Persian Gulf, which they are gradually filling up.

CLIMATE AND VEGETATION.

General.

479. Asia may be broadly divided into **two** great climatic areas: (1) the **monsoon** region, including India, Indo-China, the east of China as far as the Gulf of Pechili, and Japan; (2) the rest of the continent. Each of these great regions has, of course, subdivisions in which there are great varieties of climate.

Isotherms.

480. The **January isotherm** of 70° crosses the south of Arabia, the north of India, and the centre of Indo-China. The isotherm of 32° crosses the Black Sea and Caspian Sea, Lob Nor, the middle of the Hwang Ho basin, and Korea. There is a pole of cold in north-east Siberia, round **Verkhoyansk**, where the average January temperature is —50°. The July temperature in the same region is no less than 100° higher.

The **July isotherm** of 32° is entirely clear of the continent on the north, and the isotherm of 80° is in nearly the same position as the January isotherm of 32°. There is a pole of heat (90° and above) in Arabia, Persia, the Indus basin, and northern Tibet.

It should be noted that these figures are corrected to sea-level, and do not give the actual temperatures of the plateaus, which are lower in proportion to their elevation.

Climates of Northern and Western Asia.

481. Outside the monsoon region Asia as a whole has **great extremes** of temperature and a scanty rainfall. This is due to great distance from the sea, and especially to the fact that that part of Asia lying within the zone of westerly winds has a great land mass (Europe) on the west, and a still greater one (Africa) on the south-west.

In the extreme north is a great **tundra** region, bounded approximately by the Arctic Circle, and having an annual rainfall of less than 10 inches. Its only economic production is **fossil ivory** from the extinct mammoth.

The greater part of the **Siberian Plain** is a region of mixed wood and grassland, with a small rainfall (10-20 inches) occurring chiefly in the summer.

On the lower slopes of the mountains, extending from the Tian Shan to the Stanovoi Mountains, is a broad belt of **forests**, chiefly pine, crowned by an Alpine flora above the tree line.

Towards the south-west of the plain the rainfall diminishes and the rich grassland passes into poor **steppes** and then into sandy desert.

The **desert** region of Asia is continuous with that of northern Africa, and coincides roughly with the area of inland drainage. It includes the greater part of the plateaus of Arabia and Iran, the Aral and Caspian depressions, and the basins of Taklamakan and Gobi.

482. The desert of **Russian Turkestan** contains many fertile **oases** irrigated by rivers, where much cotton, wheat, and southern fruits are grown in the bright hot summers.

The chief oases are those of **Merv**, where the Murghab River ends in the sands; **Khiva**, near the Oxus; **Bokhara** and **Samarkand**, on the Tarafshan; and **Khokand**, the centre of the very rich valley of Ferghana, on the upper Syr.

These towns were once the capitals of independent states, but were all absorbed by Russia during the nineteenth century.

In the steppes north of Turkestan the only inhabitants are **pastoral nomads**. North of the steppes, between about 50° and 60° N., western Siberia will probably become a great **grain-growing** district, for nearly the whole of this belt can be made fit for cultivation, though most of it as yet is marsh or forest. It is comparable in position, configuration, and fertility with the prairies of southern Canada, but has the disadvantage of having no easy waterway to the sea.

483. The table-land of **Asia Minor** is barren and partly desert, but the valleys and the narrow coast plain are very fertile, and possess a rather extreme climate of the Mediterranean type. Raisins, figs, cotton, opium, barley, wheat, and mohair wool are largely produced.

In **Arabia** the coast mountains of Yemen in the south-west and Oman in the south-east are the only districts with a fairly heavy rainfall. **Yemen** has a high reputation for its **coffee** (Mocha coffee). The Arabs of the interior are independent nomads, famous for their horses and camels. The **date-palm** is the chief tree of the oases.

Iran is a desert with some fertile irrigated valleys, which produce wheat, opium, raw silk, cotton, tobacco, and roses (at Shiraz). Almost all commerce in Iran is carried by mules or camels, the country being almost wholly devoid of roads as well as of railways.

In **Tibet** and **Mongolia** the winter is very severe and the summer cool, owing to the great elevation. There is very little population except in the Brahmaputra valley. **Wool** is the principal production.

In **Chinese Turkestan, Kashgar** and **Yarkand** are the centres of two very fertile oases on tributaries of the Tarim. They were once of importance as centres of overland trade from China to western Asia and Europe, in the days when the sea-route was unknown.

The Monsoon Countries.

484. The special feature of the climate of the monsoon countries is its **heavy rainfall** during the hottest part of the year (Chapter IV., § 84). These countries, situated within or just outside the tropic, are therefore among the most productive in the world, and since the dawn of history have been densely peopled. Something like **half the population of the world** lives in south-eastern Asia from India to China, including the adjacent islands.

A special feature of this part of the world is that a great majority of the inhabitants are vegetarians, partly on account of their religion, and partly from poverty and the fact that cultivated land can support a far denser population than pasture land.

485. For the most part, the monsoon lands of Asia have **abundant summer rain**, except the **Indus valley** and the **Thar** or Indian desert, on the left of the lower Indus, which is just on the margin of the monsoon. Here the rainfall is always too small for cultivation, and there is comparatively little difference between summer and winter, as regards rain.

In the rest of India, shielded by the great wall of the **Himalayas**, the contrast between the rainy summer and the dry sunny winter is greater than in any other monsoon country, both China and Japan having moderate winter rains.

Ceylon and the extreme **south of India** have **two** rainy seasons, as they intercept both the south-west and the north-east monsoon.

The **heaviest rainfalls** of the world are on the Western Ghats, the west coast of Burma, and the eastern part of the Himalayas, in Assam.

The monsoons of India are, however, very **variable**, bringing much less rain in some years than in others. The Central Provinces of India, especially, are in a region of uncertain rainfall, and hence to guard against famines (which still occasionally occur) **irrigation** works are necessary in many districts where in a normal year the rainfall is sufficient.

A special characteristic of the **north-east monsoon**, on which the east coast of India largely depends, is that the greater part of a season's rain may fall in two or three tremendous downpours. Hence the province of Madras contains large numbers of great storage tanks for rain water. In the rest of India, as in Asia generally, irrigation is carried on by canals from rivers.

486. Most of the **Malay Archipelago**, which is almost bisected by the equator, is always warm and always wet. There is hardly any difference in temperature throughout the year, and there is no dry season. The Philippines, like the neighbouring mainland, have heavy summer rain and light winter rain.

487. In **India** rice and millet are the staple foods of a large part of the population. **Rice** requires very high temperature and wet land, and is grown chiefly in the deltaic lowlands, especially in the lower Ganges basin (Bengal). **Millet** is grown chiefly in the drier regions of the Deccan and the Indus valley, but it is widely spread over the whole country.

Southern India is too hot for **wheat**, which is grown as a winter crop on the irrigated plains of the Panjab and in the north of the Deccan, and, except in famine years, is largely exported, chiefly from **Karachi**, the port of the Panjab.

The chief textile crops of India are **cotton**, in the hinterland of Bombay, especially in the valley of the Tapti; and

jute, in the Ganges plain. Indian **flax** is grown (chiefly in the north) only for its seed (linseed), not, as in Europe, for the fibre. **Poppy** cultivation (**opium**) is kept up on a large scale round Patna on the Ganges. **Indigo** is largely grown in Bengal, Agra, and Madras.

Tea, though one of the chief commercial plants of India, is for the most part grown on comparatively small areas on the hills of Assam and of Ceylon.

In **Burma** and throughout **Indo-China** the chief production of the deltas is **rice**, the staple food and the principal export. **Teak** is the most valuable tree of the hill forests.

Forests cover most of the hilly parts of India, the tree-line being about 12,000 feet high on the Himalayas. **Teak** is the most important timber tree for export, and **bamboo** for local use. The best teak grows on the Western Ghats and in Burma. In southern India **palms** of many varieties give useful products—matting, ropes, oil, fruit, etc.

488. In **China** the most fertile and densely peopled regions are (1) the northern plain, (2) the plain of the Han and middle Yangtse, (3) the "Red Basin" of Sechwan, (4) the deltaic plain of the Sikiang.

In the northern plain are grown chiefly straw, **cotton**, and **cereals**; in the Yangtse plain and delta **tea**, silk, cotton, and **rice**; in Sechwan opium, silk, **tea**, wheat, and maize; in the Sikiang basin **rice**, sugar-cane, silk, and **bamboo**—the chief building material of the country.

Silk and **tea** are the chief products for export. Chinese tea goes chiefly overland to Siberia and Russia, Britain and the British colonies being supplied almost exclusively from India and Ceylon. The fisheries of Chinese rivers are very important.

489. In the north of **Japan** Yezo is very cold in winter, and the sea is often ice-bound along the coast. The main island has a climate not unlike that of England (though Tokyo is about 16° further south than London), but with more summer rain. The west coast is colder than the east, being uninfluenced by the **Kuro Siwo**.

The southern islands of Japan are sub-tropical. **Rice**, barley, millet, and sugar-cane are the plants chiefly grown in Japan for home consumption; **silk** and **tea** are the principal agricultural exports. The most productive districts are naturally in the south.

The wax tree, the lacquer tree, and the camphor laurel produce articles of much use in various industries. **Camphor** is grown more largely in Formosa than in Japan proper. Not nearly enough rice is grown in the country, and the largest imports are rice for food and **raw cotton** for the rapidly growing textile industry.

490. The islands of the **Malay Archipelago** are immensely fertile, but with the exception of **Java**, which is as densely peopled as England, their resources are only beginning to be developed. **Rice**, sago, sugar, and tapioca are staple foods and are also exported. The most characteristic products of the islands, for which they have long been famous, are **spices**, *e.g.* pepper, cinnamon, nutmegs, cloves, etc.

Java produces excellent **coffee**, and its production of tea, cinchona (quinine), and rubber is rapidly extending. **Tobacco** is largely grown in Borneo, Sumatra, and the Philippines. The last-named also produce the finest kind of **hemp**.

MINERALS.

491. Asia is rich in minerals, but, owing to lack of railways, mining is not yet nearly so important as it is in the other continents. **Gold** is found chiefly in the mountains forming the southern edge of the Siberian Plain, especially in Trans-Baikalia and the middle basin of the Amur. There is another mining district (gold and silver) in the Altai Mountains, south of Tomsk, and a third (gold and platinum) in the Urals round Ekaterinburg.

Petroleum, however, is by far the most important mineral of Asiatic Russia. **Baku**, situated on the Caspian at the east end of the Caucasus range, is second only to Pennsylvania in its production of petroleum, which is sent by rail or through huge iron pipes to **Batum** on the Black Sea for distribution to foreign markets, or by steamer to the Volga for use in Russia. Petroleum is also plentiful in the Irawadi valley.

492. Coal, of rather inferior quality, is abundant in India, chiefly in the north-east, in a tract extending from the Hugli, north of Calcutta, westward to Jabalpur.

China contains enormous coal-fields, much larger than those of all Europe; the only coal-fields, however, that have yet been much worked are small and lie near the Gulf of Pechili. The province of **Shansi**, further inland, is destined some day to be a great industrial region, as it contains, in the hills east of the middle Hwang-Ho, both **iron** and **coal**, including the greatest deposit of anthracite known to exist.

Sechwan and southern **Hunan**, in Central and South China respectively, are also remarkably rich in coal and iron. No railways have yet reached any of the Chinese coal-fields, except those in the north-east, near Tientsin. The coal of Japan is chiefly in the extreme north and south—Yezo and Kyushu.

The south of the Malay Peninsula, especially Perak, and the Dutch islands of Banka and Biliton further south, furnish at present the greater part of the world's supply of **tin**.

Among other minerals may be mentioned the **graphite** of Ceylon, the **jade** and **rubies** of northern Burma, and the **copper** of Ashio in Japan, north of Tokyo.

PEOPLE AND STATES.

493. The greater part of the inhabitants of Asia belong to the **Mongolic** or yellow division of mankind. This is the dominant race in China, Korea, Japan, Indo-China, and Turkey. The original inhabitants of all northern Asia were Mongols, but a steady stream of Russians, who are Slavs of the **Caucasic** or white race, is pushing eastward into Siberia.

The races of the East Indian Archipelago, collectively known as **Malays**, are also principally Mongolic, but in the eastern Malay islands and in parts of the Philippines there are considerable numbers of **Negritoes**, who are of the **Ethiopic** or black division.

The **Caucasic** or white race, apart from the Russian Slavs just mentioned, is principally represented in Asia by (1) the Hindus of India, (2) the Semites (Arabs, Syrians).

The only states in Asia of the first importance which are not under European control are **China** and **Japan**. The Chinese empire occupies about one quarter of the continent, but China proper, which contains more than nine-tenths of the population, is less than half the empire.

Japan is the only country in Asia which has adopted Western ideas, inventions, and parliamentary institutions. Though a small country, it has become an important **naval power**, and is rapidly becoming a great **manufacturing** and **commercial nation**.

Russia in Asia occupies more than one-third of the continent, but contains less people than the single Chinese province of Shantung, and can never be very densely peopled. The population, however, is rapidly increasing by immigration, and the agricultural resources are being developed. **Siberia** is the only part of Asia that is being colonised and settled by Europeans. In the colonies of other powers Europeans merely form a small governing or trading class.

The **Indian Empire**, the most populous part of the British dominions, covers an area slightly greater than that of China proper, and contains about seven times as many people as the British Isles. Britain also possesses in Asia the important coaling stations of **Aden** and **Perim**; the great commercial ports of **Singapore** and **Hong Kong**; the **Straits Settlements** in the south of the Malay Peninsula; **Labuan** and the north of **Borneo**.

French possessions in Asia are confined to **Indo-China** and a few small tracts (about 200 square miles) on the east coast of India. In Indo-China France possesses Tongking, Annam, Cambodia, and Cochin China, with a total area slightly greater than that of France, and a population about half as great. The native kingdom of **Siam** is a "buffer" state between the French and British possessions.

The only **American possession** in Asia is the **Philippine** Islands, which were ceded to the United States by Spain in 1898. The rest of the Malay Archipelago is owned by **Holland**, except North Borneo (British) and the eastern half of Timor (Portuguese).

Turkey in Asia consists of Asia Minor, Syria, Mesopotamia, and the north and west of Arabia. **Persia** is a feeble absolute monarchy, the north of which is almost wholly under the control of Russia, while the south, round the Persian Gulf, is a British "sphere of influence." **Afghanistan** is a savage inaccessible kingdom, jealously guarding its independence against the pressure of Russia from the north and India from the south.

In the struggle for political and commercial control in China various European powers seized territories on or near the **Gulf of Pechili**. Russia occupied the very important strategical position of **Port Arthur**, commanding the entrance to the gulf, but was compelled in 1905 to cede it to Japan, and also to evacuate Manchuria. **Weihaiwei**, in the north of Shantung, and **Kiau-Chau**, in the south, were occupied by Britain and Germany respectively.

COMMUNICATIONS.

494. The **Trans-Siberian Railway**, strictly, has only been completed to **Stretensk**, at the head of navigation on a tributary of the Amur. Steamers run down the Amur to **Khabarovsk**, whence a railway line runs up the Usuri valley to **Vladivostok** on the Pacific coast.

Direct railway transit across the continent is effected by the Manchurian branch of the Siberian Railway, which diverges near **Chita** and runs south-east to **Harbin**, where it forks, one line running east to Vladivostok, and the other south, through **Mukden** (the capital of Manchuria), to **Port Arthur** and **Pekin**.

The Siberian Railway begins on the western side at **Cheliabinsk**, the junction of lines from Moscow through Samara, and from Perm through Ekaterinburg. As far as **Irkutsk** the line was fairly easy to construct, the only difficulties being the bridging of large rivers. The eastern section has much steeper gradients, and rises to over

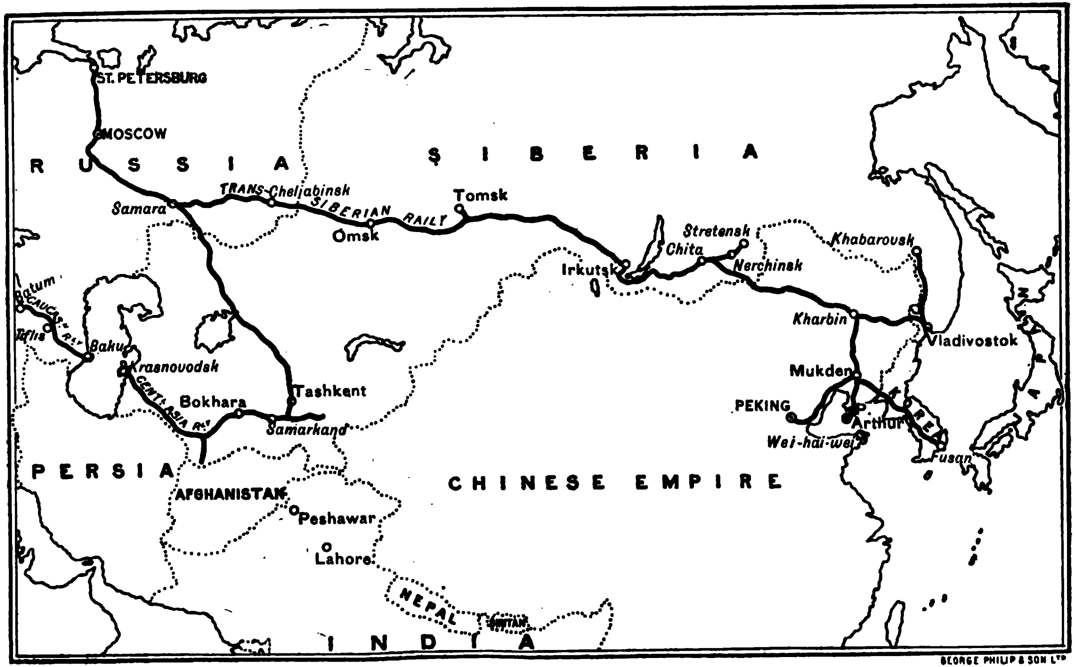

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Fig. 63.—The Trans-Siberian Railway.

3,000 feet in the Yablonoi Mountains. The chief towns on the line—**Omsk**, **Tomsk** (on a short branch), **Krasnoyarsk**, **Irkutsk**—are situated, as might be expected, where the railway crosses waterways at right angles to it.

The railway was mainly built to enable Russia to "Russianise" Manchuria (an object which was defeated by Japan); but it is of growing **commercial** importance. It takes many immigrants into Siberia, and brings back **wheat**, butter, tea (from China), and other agricultural products and precious metals; and furnishes of course the quickest passenger route from Europe to the Far East.

The **Central Asian Railway** starts from **Krasnovodsk** on the Caspian Sea opposite **Baku**, and links up the oases of **Merv**, **Bokhara**, **Samarkand**, and **Tashkent**. A branch from Merv reaches the Afghan frontier at **Kushk**, and may be continued through Herat and Kandahar to join the Indian railway system at **Quetta**.

The Central Asian Railway, together with the Caucasian Railway from **Batum** through **Tiflis** (the capital of Caucasia) to Baku, is of great strategical importance, as it enables Russia to concentrate troops rapidly on its southern Asiatic frontiers, and so threaten either Persia or Afghanistan. The railway has lately been connected with the general European system from Orenburg, via **Khiva**.

REGIONS AND TOWNS.

495. The chief **Mediterranean ports** of Asia are: (1) **Smyrna**, at the head of a long gulf in the west of Asia Minor, in the centre of a fertile fruit region, famous especially for raisins and figs. (2) **Beyrut**, the port of **Damascus**, which is one of the oldest towns in Asia, and stands in a very fertile oasis at the foot of Anti-Lebanon; it is the starting-point of an important pilgrim route southward to **Mecca**, and also of the caravan route eastward across the Syrian Desert to **Bagdad**. (3) **Jaffa**, the port of Jerusalem, and therefore also the centre of a great pilgrim traffic.

On the **Black Sea** the chief Asiatic ports are: (1) **Trebizond**, the outlet of a mining district, and the starting-point of inland trade by camel or mule caravans through **Erzerum** to **Mosul** on the Tigris and **Tabriz** in northern Persia. (2) **Batum**, the western outlet of the rich valleys south of the Caucasus, and of a great iron and manganese ore district.

496. Mesopotamia, though once a rich and densely populated region (the seat of the Babylonian and Assyrian Empires), is now, like most of Asiatic Turkey, a ruined country, owing to incapable government and neglect of the great irrigation works of the past. Babylon and Nineveh are deserted ruins, and **Bagdad**, the only large town, has only a shadow of its former splendour, in spite of its very favourable situation as a river-port and trading centre.

Basra is the port of Mesopotamia, and **Bushire**, on an open roadstead in the Persian Gulf, is the port of southern Persia, but is connected with **Shiraz** and **Ispahan**, in the interior, only by a difficult mule track. The largest towns in Persia—**Teheran**, the capital, and **Tabriz**—are in the north, where there is more rain.

There are no railways in Persia, except a line 6 miles long from Teheran; and until the beginning of the twentieth century the only road in the country fit for wheeled vehicles was from Teheran to the Caspian port of **Enzeli**.

The river Karun, as far as **Ahwaz**, is the only navigable river of Persia, and a road has lately been built from Ahwaz to Ispahan. Hence **Mohammera**, the seaport of the Karun, is growing at the expense of Bushire.

497. Afghanistan is a country of great strategical importance, as the passes leading from it, through the Suliman Mountains, to the Indus valley, are almost the only practicable land routes into India. The chief passes are: (1) the **Khaibar Pass**, a narrow defile south of the Kabul River, leading from **Peshawar** on the Indian side to **Kabul**, the capital of Afghanistan. Most of the many conquerors of India have entered the country by this route, the valley of the Kabul itself being impassable. (2) The **Bolan Pass** leads from the Indus plain to **Quetta** in British Baluchistan, and thence to **Kandahar**, on the fertile plain watered by tributaries of the Helmand. (3) The **Bamian Pass** leads westward from Kabul, between the Hindu Kush and the Koh-i-Baba range, to the valley in which stands **Herat**, the key of Afghanistan on the west.

Herat has been called the "Key of India," but the possession of this key would be of little help towards unlocking the Khaibar and Bolan gates, the keys of which are Peshawar and Quetta.

498. In Arabia, **Mecca** and **Medina** are only of importance as centres of Mohammedan pilgrimages. In the extreme south, **Aden**, built on a small peninsula with a sheltered harbour, is a strongly fortified British coaling-station of great importance, and also, from its position on main steamship routes, an entrepôt for the products both of Arabia and of north-east Africa.

The small island of **Perim**, in the Strait of Bab-el-Mandeb, is a private coaling-station.

Towns of India.

499. India has four main outlets to the sea, two in Continental India and two in the peninsula:—

Calcutta, on the Hugli, the western mouth of the Ganges, is the capital of India and the second largest town in the British Empire. The Hugli is only kept open with difficulty, and its navigation is very dangerous.

Calcutta exports the products of the densely populated Ganges basin—opium (chiefly for China), tea (from Assam), rice, jute, oil-seeds, indigo, and wheat. The population is chiefly mercantile and administrative, but jute manufacture is rapidly extending.

Bombay, on almost the only good natural harbour in India, is second only to New Orleans as a **cotton** port, and deals also in wheat, opium, and seeds. Cotton manufacture is growing on account of the cheapness of labour, in spite of dear coal and machinery. Unlike Calcutta, Bombay has no easy natural routes inland, and it only rose to its present great importance when railways were constructed through difficult passes of the Ghats. One line leads to Madras, and another via **Nagpur** to Calcutta, with a branch to **Allahabad** on the Ganges.

Karachi, on an artificial harbour west of the Indus, is the port of Sind, Baluchistan, and the Panjab, from which it exports much wheat.

Madras, the centre of the south-east coast plain, lies on a straight low surf-beaten shore, and until recently goods and passengers had to be landed in small boats, but a harbour has now been built in the open sea.

Colombo, the capital and only large town of Ceylon, is an important port of call for steamers bound to Calcutta or Australia or any part of the Far East. **Trincomalee**, on the north-east coast of Ceylon, has a good natural harbour, and has been fortified as a naval base.

500. The chief inland towns of India are, as one would expect, on the northern plain (compare Italy). **Delhi**, on the Jumna, was the capital of the Mogul Empire, which came to an end in 1857. It commands the routes from the Ganges to the Indus, north of the Aravalli Hills and the Thar. **Lahore**, on the Ravi, is the capital of the Panjab, where **Amritsar**, further east, has considerable textile manufactures, including "Cashmere" shawls. **Peshawar** and **Quetta** are the chief military stations on the north-west frontier.

Allahabad, at the confluence of the Jumna and the Ganges, is an important river and railway junction. **Benares**, lower down the river, is the sacred city of Brahmanism (the chief religion of India), and also a centre of the old artistic handicrafts for which India has long been famous, but which are now decaying owing to machinery and factory methods. **Lucknow**, the largest inland town of northern India, owes its importance chiefly to its former rank as the capital of the kingdom of Oudh. It is now one of the chief military stations of the plain.

The chief hill-towns of northern India are **Simla**, the summer residence of the government, and **Srinagar**, on the upper Jehlam, the centre of the lovely valley of Kashmir, famous for its shawls, made from the fine wool of the Cashmere goat.

The only large inland towns of southern India are **Haidarabad**, the capital of the state of the same name (the largest native state in India); and **Bangalore**, the chief town of the native state of Mysore. They are of no more than local importance, though Haidarabad is the fourth largest town in India.

Towns of Indo-China and Malaysia.

501. The port of the Irawadi basin is **Rangoon**, on an eastern distributary of the delta, with a great trade in rice and teak. **Mandalay**, the old capital of Burma, is a river port in the centre of the country. A railway runs from Rangoon up the Irawadi to Bhamo, near the Chinese frontier. **Maulmein** is the port of the Salwin delta and of the north-west of the Malay Peninsula (Tenasserim).

Bangkok, on the Menam, the capital and only port of Siam, is not accessible to large ships owing to a bar at the mouth of the river. **Saigon**, east of the Mekong delta, is the port of Cambodia and Cochin China.

Haiphong, north of the Songkoi delta, is the port of Tongking, and is connected by rail with **Hanoi**, the capital, at the head of the delta and of steam navigation.

502. Singapore, on a small island at the south of the Malay Peninsula, is a "half-way" house between India and China, at a point where all traffic for the Far East converges from the West and turns northward. Though entirely modern, Singapore has grown into one of the chief ports of Asia. It is a strongly fortified coaling-station, and has a great tin-smelting industry.

The two largest towns of the rich island of Java are **Batavia** and **Soerabaya**, both on the north coast at opposite ends of the island. Batavia is the capital, not only of Java, but of all the Dutch Indies. **Macassar**, in the south of Celebes, is a port which, from its central situation in the Archipelago, is favourably placed for local trade and for collection and transhipment of island products to be exported from Singapore or Batavia. **Manila**, the capital of the Philippine Islands, exports chiefly the hemp and tobacco with which its name is specially associated.

Towns of China.

503. Pekin, on a rather unproductive part of the northern plain, owes its rank as the capital of China rather to the fact that the ruling dynasty came from Manchuria, than to any special geographical advantages.

Nanking or Hankau would be a more natural capital. Pekin, however, commands the routes west and north-west to Mongolia, and north-east between the mountains and the sea into Manchuria.

Tientsin, the port of Pekin, is connected by rail with the capital, and by navigable waterways with the Grand Canal, which joins the Hwang Ho to the Yangtse delta.

Shanghai is the chief port of middle China, being the inlet and outlet of all the rich basin of the Yangtse. The port is not actually on the river, but on a small stream which enters the sea close to the estuary. More than half of all the foreign trade of China passes through Shanghai. **Nanking**, near the head of the Yangtse delta, and **Hangchau**, on a bay further south, are famous for their silk manufactures.

Hankau, **Wuchang**, and **Hanyang** form a triple city situated in the three angles formed by the confluence of the Han and Yangtse, at the head of navigation for large ships. Their aggregate population is probably over two millions, and collectively they form the greatest river port in Asia, perhaps in the world. **Hankau**, a great tea centre, is the only one of the three that is open to foreign traders. It has recently been joined to Pekin by rail, and the line will probably be continued to Canton. **Chengtu-fu** and **Chungking** are respectively the capital and the river-port of the rich "Red Basin" of Sechwan.

The most populous town of southern China, possibly of all China, is **Canton**, at the mouth of the Sikiang, a meeting-place of many waterways. It is not accessible to large steamers, but is a great centre of river and coasting traffic. A considerable proportion of the inhabitants live in house-boats on the river.

For ocean commerce southern China has only one port of the first importance—the British colony of **Hong Kong**, a small island south of the Canton River. It therefore shares the advantages of the position of Canton, with the addition of a deep spacious harbour at **Victoria**, the capital. The shipping entering the port each year has a greater tonnage than that of any English port except London, Liverpool, and Cardiff. Hong Kong and Shanghai between them almost monopolise the foreign trade of China. The one drawback of Hong Kong is its exposure to typhoons, which occasionally do great damage.

Two of the most populous towns of China—supposed to contain about a million inhabitants each—are as yet almost entirely unknown to Europeans. They are: (1) **Singan**, on the small but fertile plain of the Wei Ho, that is, on the chief route from northern China to Central Asia; and (2) **Siangtan**, on the Siang River, which drains to the Yangtse through the Tungking Lake. Siangtan is near one of the great undeveloped coal and iron districts of China, in the south of the province of Hunan.

Towns of Japan.

504. Tokyo, the capital, is a town of nearly two million inhabitants, situated at the head of a long bay on the east coast of Honshu, in the centre of the largest plain in Japan. Tokyo is not a seaport for large ships, most of the foreign trade of Japan going through **Yokohama**, an entirely modern town on a good harbour lower down the same bay. **Kobe** (Hyogo) on a bay at the east end of the Inland Sea, is the port of **Osaka**, the chief cotton manufacturing town of Japan (population over a million), and of **Kyoto**, the old capital, further inland.

Nagoya, between the old and the new capital, is the commercial centre of a very productive rice-growing plain. **Nagasaki**, in the west of Kyushu, is the chief naval port of Japan, commanding the entrance to Korea Strait. It has an excellent land-locked harbour, and the coal-field near it has given rise to important shipbuilding works.

CHAPTER XIX.

OCEANIA.

I. AUSTRALIA.

General.

505. Australia, lying between 10° and 40° S., is the only continent wholly in the **southern hemisphere.** Rather more than one-third of it is north of the tropic. The total area is nearly three million square miles, which is about four-fifths of the area of Europe.

Australia differs from the two other southern continents in having its greatest length, about 2,400 miles, from east to west. The extreme length from north to south is nearly 2,000 miles, but from the head of the Great Australian Bight to the Gulf of Carpentaria is only about 1,100 miles.

Till 1901 Australia consisted of five separate self-governing colonies—**Victoria, New South Wales, Queensland, South Australia** and **Western Australia**; but they were united in that year into the Commonwealth of Australia, which also includes Tasmania and British New Guinea.

The **boundaries** of the five states are purely conventional, consisting merely of mathematical lines, except the southern boundary of New South Wales (the Murray River) and a small part of the northern boundary of the same state. Even county divisions are generally straight lines.

Configuration and Coasts.

506. Australia is fairly compact in shape, like South Africa, which in many respects it closely resembles. The chief projections of the land are **Arnhem Land** and **Cape York Peninsula** in the north, enclosing the large shallow

Gulf of Carpentaria, with low swampy coasts. In the middle of the south coast lies the long elliptical curve of the **Great Australian Bight,** mostly bounded by cliffs about 400 feet high, and presenting the unique phenomenon of a coast-line 1,000 miles in length unbroken by even the smallest river. East of the Bight are **Spencer Gulf** and the **Gulf of St. Vincent,** with **Yorke Peninsula** between them, and **Eyre's Peninsula** between Spencer Gulf and the Bight.

The **continental shelf** of Australia is on the whole much wider than that of South Africa. It extends on the north to New Guinea, including all the Gulf of Carpentaria and the Arafura Sea and most of the Timor Sea; and on the south it extends beyond Tasmania, which was once part of the continent.

The shelf is narrowest in the south-east between Cape Howe and Cape Byron (*i.e.* close to the highest mountains). On the north-east the edge of the continental shelf is marked by the **Great Barrier Reef,** a bar of coral about 1,200 miles long, about 150 miles from the shore in the south, but only about 20 miles from it in the north.

The reef is a natural breakwater within which the water is always calm. There are a good many gaps, of which the largest is opposite the mouth of the Burdekin river. The route inside the reef is generally taken by steamers, but navigation is rather dangerous, especially at night, and sailing ships usually go outside.

Land-Relief and Rivers.

507. A line drawn across Australia from Eyre's Peninsula to Cape Arnhem divides the continent into two nearly equal parts, of which the western is much more uniform in structure than the eastern. This western half, including all Western Australia and the greater part of South Australia, is a **low table-land,** generally from 600 to 1,000 feet in height, but rising to about 3,000 feet in a few detached areas—**Arnhem Land** in the north and the **Macdonell** and **Musgrave Ranges** near the centre of the continent.

These ranges have between them a depression containing the salt **Lake Amadeus.** The rivers of the outer margin of the plateau are necessarily short, though some of them end in large estuaries. The chief rivers are the **Fitzroy**, **Ashburton**, **Murchison**, and **Swan**.

The interior of the plateau is almost wholly **desert**, and considerable areas have never been explored. The rivers are only temporary water-courses produced by the very occasional rainfall, and they disappaer either in the sand or in salt lakes, which are most numerous in the south-west.

508. The eastern half of Australia consists of (1) a central lowland extending from the Southern Ocean to the Gulf of Carpentaria, and (2) the Eastern Highlands or **Great Dividing Range**.

The lowlands consist of three areas partially separated by minor heights: (1) The coast plain of the Gulf of Carpentaria, drained chiefly by the **Flinders** River from the Dividing Range. (2) A large area of **inland drainage**, chiefly in eastern South Australia and south-west Queensland. There are many salt lakes, of which the most important are Lake **Torrens** and Lake **Eyre**. The latter is slightly below sea-level, and receives from the north-east the long **Cooper's Creek**, the chief river which does not reach the sea.

The lake region is separated by the **Flinders Range** and the **Mount Lofty Range** further south from (3) the great plain of the **Murray-Darling** (2,350 miles), the only large river system in the continent. The axis of this plain is the nearly straight line from north-east to south-west formed by the **Condamine**, the **Darling**, and the lower **Murray**.

The Condamine rises on the west of the Dividing Range in the latitude of Brisbane. It is joined in the north of New South Wales by the Darling, and this in turn by the Murray, with its tributaries the **Murrumbidgee** and the **Lachlan**, all from the Dividing Range.

The Murray (1,300 miles), though considerably shorter than the Darling, is reckoned as the main stream. It rises in the highest mountains in Australia, and its volume is more constant than that of any of the other rivers. It is, in fact, navigable by light steamers for several hundred miles, but has the disadvantage of a bar at its mouth, which prevents even small vessels from entering it from the sea.

The bar is a continuation of a sand-spit nearly 100 miles in length, called the **Coorong**, which has a long narrow lagoon behind it. The Murray flows through the large shallow Lake Alexandrina just before reaching the Coorong.

509. The **Great Dividing Range**, though insignificant in height compared with the mountains of any of the other continents, is the most salient physical feature of Australia, and has far-reaching effects on climate and products. It extends along the whole east coast, from which its crest is seldom more than 50 miles distant.

In the north, where the range is lowest, it forms the **Cape York Peninsula**. It gradually rises in height, and south of Brisbane becomes a serious barrier to communication. The southern part is known successively as the **New England Range**, the **Liverpool Range**, the **Blue Mountains**, and the **Australian Alps**, which culminate in Mount Townsend (7,300 feet), one of the peaks of the Kosciusko Group.

The range is continued at a lower elevation, under varying names, through the south of Victoria, and ends close to the sea in the extreme south-east of South Australia.

The Dividing Range falls fairly steeply on the outer side to the narrow coast plain, but descends much more gradually on the inner side, through plateaus and minor ridges, to the central lowlands.

The chief **rivers** of the western slope—the Flinders, Cooper's Creek, and the Murray-Darling—have been already mentioned. The rivers of the eastern slope are necessarily short. The largest are the **Burdekin** and **Fitzroy**, in Queensland, and even they rise on the west of the main ridge and cut a passage through it.

Climate.

510. Australia lies mostly in the belt of **south-east trade** winds, which produce an adequate rainfall all the year round on the south-east coast, from the tropic to Cape Howe. There is more rain in **summer** than in **winter**, owing to the presence in central Australia, under the vertical sun of December and January, of a pole of maximum heat (95° or more), which lowers the pressure inland, and thereby increases the force of the trade winds.

The **Dividing Range**, though it produces a heavy condensation on the windward side, is not high enough to deprive the winds of all their moisture, and slight summer rains fall over nearly the whole Murray-Darling basin, though there is never enough for agriculture without irrigation.

At the same season, the winter (north-east) **monsoon** of the northern hemisphere, drawn across the equator and thereby diverted so as to blow from the north-west, produces a very heavy rainfall in Arnhem Land and northern Queensland, which are very dry in winter, when they are in the trade-wind belt.

The **interior** of Australia, from about 140° E. to the west coast, is at all seasons very dry, on account of (1) the position of the Eastern Highlands, (2) the intense heat in summer, preventing condensation, and (3) the high pressure in winter, increasing the strength of the off-shore winds of the north-west.

The extreme south-west corner of the continent and the south-east of South Australia are in the latitude of Cape Town, and, like it, receive their rain chiefly in winter. **Victoria**, south of the Dividing Range, has a moderate rainfall very evenly distributed throughout the year.

The **temperature** of Australia in winter depends mainly on latitude, average July temperatures ranging from about 75° in the north to about 50° in the south. In summer, on the other hand, temperature depends mainly on distance from the sea, increasing inland. January temperatures range from about 100° in the centre of the continent to 85° in the north and 70° in the south. No part of the continent has any very great seasonal difference of temperature.

Vegetation.

511. Owing to the perennial rain of the south-east and the heavy summer rain of the north, a belt of **forest** (now partially cleared for cultivation) extends round nearly the whole east and north coasts, and reappears in the south-west angle. The most important Australian trees are various species of eucalyptus, some of which reach a height of 400 feet. The jarrah and karri are very hard woods, largely used for paving.

On the western slope of the Dividing Range, where there is still a fair rainfall, is a belt of **savanna** with scattered trees and good pasture for cattle. This is succeeded by the lower "**downs**," which are drier, but in ordinary seasons produce enough pasture to support enormous flocks of sheep, growing the best wool in the world. The rainfall is precarious, however, and in dry years sheep perish by hundreds of thousands; but rabbits, which eat up the grass, are a worse enemy than drought.

In some parts which are too dry even for grass, sheep feed on a low shrub called **salt-bush**. Grass land is also found in the north, inside the forest belt, and along the rivers of the west coast.

A large oval area, extending from about 117° to 140° E., and from the Great Australian Bight to about Lat. 18° S., is so dry as to be practically uninhabitable, and the western half of this area is sheer sandy desert.

512. Agriculture is less important in Australia than in any other continent, the staple occupations being **sheep-rearing** and **mining**. **Wheat** is grown on a large scale in only two states—Victoria and South Australia. The product is of fine quality, but the yield per acre is small and very variable, owing to the great variations in rainfall from year to year. In Victoria the wheat of 1903 averaged less than 1½ bushels per acre, but in 1904 increased to nearly 15 bushels per acre. Large irrigation works have been made on the lower Murray. The irrigated area is chiefly devoted to fruit-growing, for which the sunny climate is a great advantage. The chief cultivated plants of Queensland, in the neighbourhood of the tropic, are sugar and maize.

The native **flora** and **fauna** of Australia are markedly distinct from those of any other part of the world—a fact pointing to complete isolation for an immensely long period. At the time of the first British settlement there were no mammals except rats and a few species of marsupials, chiefly kangaroos and oppossums.

Minerals.

513. Australia is very rich in precious metals, and the **gold** discovered in Victoria about 1850 was the cause of the first large increase of population. For a good many years the Victorian gold-fields, centred round **Ballarat** and **Sandhurst** (Bendigo), were the richest in the world, and they are still important, though the production is slowly decreasing. The metal is obtained from quartz rock.

Gold is also widely distributed in the other states, especially in Queensland, at **Charters Towers** on the Burdekin, **Mount Morgan**, near the Fitzroy, and **Gympie**, north of Brisbane; and at many points in Western Australia, especially around **Coolgardie** and **Kalgoorli**, to which a railway has been built through the desert from Perth. They are in so sterile a region that water has to be pumped from a reservoir near Perth, about 300 miles distant.

Owing to recent discoveries of gold the population of **Western Australia** is increasing far more rapidly than that of any other part of the continent.

514. **Silver** is chiefly mined at **Broken Hill**, in New South Wales, east of the Flinders range; **copper** at **Burra Burra**, north of Adelaide, and at **Wallaroo** and **Moonta** in Yorke Peninsula; tin in the north of Queensland near **Herberton**, and in the south at **Stanthorpe**.

The chief **coal-field** in Australia lies along the coast of New South Wales on both sides of Sydney. **Newcastle**, in the north of this coal-field, sends coal to all the states of Australia, and also to India and China. In Queensland there are several large coal-fields as yet undeveloped.

Population.

515. The **aborigines** of Australia probably number not more than 60,000, and are steadily diminishing. They are very low in the scale of humanity, and have no close resemblance to any other race, though they are nearest to the negroes. The **Tasmanians**, who were akin to the Papuans or Melanesians of New Guinea, another branch of the Oceanic negroes, are extinct.

The population of Australia is predominantly of **British** descent, with a slight admixture of Polynesian and Chinese in the east and north. Owing to the peculiarities of configuration and climate the greater part of Australia must always be thinly populated. At present the whole continent contains considerably less people than there are in London.

Owing to the fact that the chief products—wool, frozen meat, and metals—are almost entirely exported to Europe, and that there are hardly any manufactures, the great bulk of the population is in the seaports and on the goldfields. Melbourne and Sydney alone contain more than one-quarter of the population of the continent, while more than half the inhabitants of Victoria live in the three towns of Melbourne, Ballarat, and Sandhurst.

Routes and Communications.

516. The four eastern capitals, **Adelaide, Melbourne, Sydney,** and **Brisbane,** are joined by railway, mostly inside the crest of the Great Divide, and a coast railway runs from Brisbane to **Rockhampton.** The line from Melbourne to Sydney crosses the Murray at **Albury,** the head of navigation. Numerous branches run from Melbourne to various points on the south coast and on the upper Murray.

From the Queensland ports of **Brisbane, Rockhampton,** and **Townsville** three lines run inland, nearly due west, for several hundred miles, through the pastoral belt to mineral deposits. The chief inland line from Sydney runs through the pastoral district called the **Riverina** to **Bourke** on the Darling.

From **Adelaide** a transcontinental line has been projected to **Palmerston** and **Port Darwin** in the north. It has been completed from Adelaide to beyond Lake Eyre, and a **telegraph** line has been carried right across the desert to Port Darwin, whence a submarine cable runs to Java, Singapore, and India.

From **Perth** railways run (1) north to **Geraldton** (from which a line runs inland to the Murchison gold-fields), and (2) south to **Bunbury** and **Albany**, the ports of the south-west. (3) The line from Perth to **Kalgoorli**, already mentioned (§ 513), is being continued northwards through newer gold-fields to join the inland line from Geraldton.

Australia is telegraphically connected with the outer world by **submarine** cables (1) from Brisbane and Auckland (New Zealand) through Norfolk Island, Fiji, and Fanning Island to **Vancouver**, (2) from Adelaide to Perth, and thence through the Cocos Islands and Mauritius to **Durban**, (3) the Java cable already mentioned (4) rom Sydney to **Wellington** (New Zealand).

Towns.

517. Sydney, the capital of New South Wales, is built chiefly on a small peninsula on the south side of the magnificent fjord-like harbour of Port Jackson, which has many "coves" with deep water close to the shore. Sydney is the chief port of Australia, and its trade is greater than that of any other port in the Southern Hemisphere. The suburb of **Parramatta**, at the head of the harbour, is famous for its oranges.

Melbourne, the capital of Victoria, and the temporary seat of government of the Commonwealth (pending the erection of a new capital), is on the Yarra River, at the head of Port Phillip Bay, which affords a large area of sheltered water, but has a difficult entrance. **Geelong**, at the west end of the bay, is a port with woollen manufactures.

Brisbane, the capital of Queensland, and the outlet of the fertile Darling Downs, lies on both sides of the Brisbane River, which is only kept open by constant dredging. **Rockhampton**, further north, is the port of the Fitzroy River, and of the rich gold mines of Mount Morgan, in the Dividing Range.

Adelaide, the capital of South Australia, between the Gulf of St. Vincent and Mount Lofty, exports much silver, copper, and wheat from its outport on the gulf. Mails for Melbourne and Sydney are landed from steamers at **Port Adelaide** to take advantage of the quicker rail transit.

Perth, the capital of Western Australia, is about 10 miles from the mouth of the Swan River, on which its port of **Fremantle** is situated. **Albany**, on the fine natural harbour of Princess Royal in King George Sound, is a port of call for mail steamers and a fortified naval coaling-station.

The only important inland towns are those already mentioned, the sites of which have been determined solely by the discoveries of gold or other minerals.

Tasmania.

518. Tasmania, an island nearly as large as Scotland, is separated from Victoria by **Bass Strait.** It is mainly highland, the whole centre and west of the island being occupied by a **plateau**, generally from 3,000 to 4,000 feet in height, with deep narrow valleys worn by torrents.

East of the plateau is a lowland strip from the mouth of the **Tamar** to that of the **Derwent**, and farther east again is a smaller highland. Ben Lomond in the north-east and Mount Cradle in the north-west are both over 5,000 feet. The south-east coast is much indented.

The chief rivers, the **Macquarie** (flowing into the Tamar estuary) and the **Derwent**, are nearly parallel, but flow in opposite directions. Between them, in the centre of the island, is a very picturesque lake region, appropriately divided into the counties of Westmorland and Cumberland.

Tasmania is wholly in the belt of westerly winds, and is therefore well watered, especially on the west side; but the whole island receives an adequate **rainfall**, greater in winter than in summer; and, excepting a few of the higher summits, the whole is cultivable, or provides at least good pasture.

The **climate** is very similar to that of Devon and Cornwall, and, like Devon, Tasmania is famous for its **apples**, which are the chief agricultural export. As in all the Australian colonies, sheep are important, and there are valuable forests of pine and eucalyptus.

The east of the island is rich in **coal**, and the west in **tin**. The only towns of any size are **Hobart**, the capital, on a fine harbour in the estuary of the Derwent, and **Launceston**, at the head of the Tamar estuary.

II. NEW GUINEA.

519. New Guinea, separated from Australia by Torres Strait and the Arafura Sea, is the **largest island** in the world not reckoned as a continent, its area being more than three times that of Great Britain.

A mountainous backbone runs through the whole island from west to east, the principal heights being in the **Bismarck Range** in the centre (over 15,000 feet), and the **Owen Stanley Range** (about 13,000 feet), which fills the narrow south-eastern peninsula.

The south is a lowland, drained by the **Fly**, the largest river in the island. Many of the rivers are navigable, but the interior of the island is still almost entirely unknown.

Lying between the equator and 10° S., New Guinea receives heavy **monsoon rains** from the north during the northern winter, and heavy rain from the south-east trade winds during the northern summer. There is, however, no really dry season anywhere, and owing to the constant high temperature the whole island, except on the highest summits, is densely **forested** with almost impenetrable jungle.

The natives (**Papuans**) are a branch of the eastern negroes, akin to the Melanesians of the neighbouring islands. They are a very degraded race, and cannibalism still survives amongst them. The few white men in New Guinea are chiefly engaged in alluvial gold mining.

Politically the island is divided among three powers—Holland in the west, Britain in the south-east, and Germany in the north-east. Dutch New Guinea occupies more than half the total area. British New Guinea is a dependency of the Australian Commonwealth. The chief white settlement is at **Port Moresby.**

III. NEW ZEALAND.

Position and Area.

520. The group of islands called **New Zealand** is about 1,200 miles east of Australia, the nearest large land mass. They lie almost wholly between 35° and 47° S., that is, in approximately the same latitudes as Italy. The eastern extremity is nearly on the meridian of 180°.

There are two principal islands, the **North** and **South Islands**, separated by **Cook Strait**, about 20 miles wide at the narrowest. The much smaller and almost uninhabited **Stewart Island** (about three times as big as the Isle of Man) is separated from South Island by **Foveaux Strait**. The total area of New Zealand is slightly less than that of the British Isles. South Island is almost exactly equal in area to England and Wales.

Configuration and Coasts.

521. The coast is generally high, with deep water close to shore, and is much indented, especially in the extreme north and in the south-west. On the latter coast are many **fjords** (here called "**sounds**") comparable in grandeur, though not in extent, with the fjords of Norway. The sounds afford splendid anchorage in stormy weather—this coast is one of the stormiest in the world—but owing to the fact that they are backed by lofty mountains they are of no use as commercial harbours.

The chief physical feature of New Zealand is a long **chain of mountains** from the south-west of South Island to East Cape in North Island, broken only by Cook Strait. In South Island the main ranges are near the west coast. The central and highest part is called the **Southern Alps**, in which Mount Cook rises to over 12,000 feet.

There are large snowfields and **glaciers**, some of the latter descending to within 1,000 feet of sea-level. On the eastern slope are many long narrow mountain **lakes** like those of Scotland or northern Scandinavia. No railway crosses the mountains of South Island except a line from Christchurch to Greymouth, over **Arthur's Pass** (3,000 feet) and through the narrow **Otira Gorge**. For more than 100 miles south of this there is not even a road between east and west.

In the north of South Island the mountains spread out, enclosing several ranges between **Tasman Range** on the west and the **Kaikouras** on the east. The latter are continued beyond Cook Strait in the lower ranges on the east of North Island.

Three isolated volcanoes rise west of the main ranges in North Island. Two of them, **Tongariro** and **Ruapehu** (9,700 feet), near the centre of the island, are still active; the third is the perfectly symmetrical cone of Mount **Egmont** (8,300 feet), close to the western sea. North of Tongariro is the largest lake in New Zealand, **Lake Taupo**. Between this lake and the Bay of Plenty lies an intensely volcanic region containing several active peaks and many geysers, hot springs, and hot lakes.

The **coast plains** of New Zealand are not very extensive. The most important is **Canterbury Plain**, a strip some 25 miles wide extending for about 150 miles along the middle of the east coast of the South Island. There are smaller lowlands on the north of Foveaux Strait, round Hawke Bay, on the coast strip from Wellington to Mount Egmont, and north of Auckland.

Rivers.

522. The rivers of New Zealand are very numerous, but are generally short and very rapid. The only navigable river is the **Waikato**, flowing north from Lake Taupo to the west coast. The largest river of South Island is the **Clutha**, running nearly due south, and draining several lakes.

Climate.

523. The **climate** ranges from sub-tropical in the extreme north to cool temperate in the south. The climate is on the whole cooler than that of any continental land in the same latitude, and is very equable. The summers are very similar to those of England (although the latitude is that of Italy), but the winter is distinctly warmer than in England.

As in England, and for the same reason (prevailing westerly winds), the heaviest **rainfall** is on the west. In North Island rain is distributed fairly uniformly, as the mountains are mostly on the east. But in South Island the mountain barrier is higher, more continuous, and near the west coast, so that there is a very marked contrast between the saturated west and the eastern plains, which are about as dry as eastern England. The rainfall at Hokitika on the west coast is about five times as great as at Christchurch, 100 miles away. There is no dry season anywhere in the islands.

Vegetation and Animals.

524. When first occupied by the British (1838) New Zealand was almost entirely destitute of animals, the largest mammal being a species of small dog, now extinct. Domesticated animals of all kinds have, however, been introduced and flourish.

New Zealand never suffers from prolonged drought, and hence both its pastures and its arable land are superior to those of Australia. The western side of both islands was originally densely **forested**, chiefly with pine and beech. Large clearings have been made for agriculture in North Island, but the west of South Island is both too wet and too rugged ever to be of any use for agriculture.

The **kauri pine**, found chiefly in the north of North Island, is the most important tree. It furnishes good timber, and also a valuable resin, **kauri-gum**, which, however, is mostly obtained in the fossilised form by digging, and is officially classed as a mineral.

The eastern slopes of the islands consist mostly of open undulating **grass-land**, with plantations of imported trees in the settled districts near the coast. About two-thirds of New Zealand is considered suitable for agriculture or grazing, but about half this area is still forested.

As in Great Britain, the largest cereal crop is **oats**, and this is followed by **wheat**. The yield per acre is very much greater than in Australia, and nearly equal (occasionally superior) to the yield in England. Pasture, however, is much more important than agriculture. There are about 20 **sheep** and 2 **cattle** to every person in New Zealand, and all the leading exports except gold —**wool, frozen-meat**, butter, and cheese—are directly dependent on pasture.

All English fruits are grown, and "southern" fruits—oranges, lemons, and grapes—flourish in the north of North Island.

Minerals.

525. Coal of high quality is found in the north-west of South Island, between Greymouth and Westport, and in the north of North Island. **Gold** is chiefly found in the south-east of South Island, and **silver** is also abundant. New Zealand possesses no iron ores.

Population.

526. The natives of New Zealand, the Maoris, are slowly dying out. They now number less than 40,000, and live principally in North Island. They are an intelligent artistic race, a striking contrast to the Australian natives. Some authorities class them with the Malays, and others include them, with the Polynesians, in the "Indonesian" branch of the Caucasic race.

Apart from the Maoris, more than 98 per cent. of the New Zealanders are of **British** descent, and there is no other part of the Empire so exclusively British. Scotchmen settled chiefly in the south of South Island—a fact indicated by the many Scotch names of towns in that region. The total population is divided nearly equally between the north and south islands.

Towns.

527. As in so many other respects, so too in the matter of towns, New Zealand is strikingly unlike Australia. In every state of Australia the capital is immensely larger than any other town, and Melbourne and Sydney would be great towns even in Europe or America. In New Zealand, on the other hand, no one or even two centres of population overshadow the rest. There are **four** principal towns, widely separated and approximately equal in population (50,000-60,000).

Auckland, the former capital and still the largest town, is beautifully situated at a point where the North Island is only six miles wide, between Manukau Harbour on the west and Waitemata Harbour on the east. The former is too shallow for large ships, so that the town is on the eastern side, and steamers for Sydney have to sail round the north of the island.

Wellington owes its selection as the seat of government to its very central position on a safe inlet (Port Nicholson) in the south of North Island, near the narrowest part of Cook Strait. It has large exports of dairy produce.

Christchurch is a few miles inland at the north end of the Canterbury Plains. Its port, **Lyttelton**, on an inlet of the rocky volcanic Banks Peninsula, exports most of the wool of New Zealand.

Dunedin, the outlet of the chief gold-fields, is at the head of the beautiful Otago Harbour, but large ships have to stop at **Port Chalmers**, at the mouth of the harbour.

The minor parts are **Westport** and **Greymouth**, on the chief coalfield, both at the mouths of rivers obstructed by bars ; and **Invercargill**, on an inlet of Foveaux Strait, the outlet of the fertile plain of Southland.

IV. PACIFIC ISLANDS.

528. Many thousands of small islands dot the surface of the western Pacific. They appear crowded on an ordinary map, but their total area is only about equal to that of England and Wales, and the groups are separated by great spaces of open ocean.

They are usually divided into three large regions:—

(1) **Melanesia** ("islands of the blacks") includes the islands east of New Guinea, as far as about 170° E. They are inhabited by a branch of the negro race akin to the Papuans.

(2) **Micronesia** ("small islands") includes the islands north of the equator from the Ladrones and Pelew Islands to the Gilbert Islands.

(3) **Polynesia** ("many islands") includes the islands from about 170° E. to about 130° W. They are inhabited by a brown-skinned people akin to the Maoris. Most of the islands are in the southern hemisphere, the **Hawaiian** or **Sandwich** Islands being the only important group in the north.

The islands are all either **volcanic** and mountainous or have been built up by **corals** from submarine volcanic peaks or ridges, not far below the surface. There is a very marked distinction between the "**high**" volcanic islands, most of which rise to several thousand feet, and the "**low**" islands, consisting entirely of coral limestone and coral sand, never more than 20 feet high and generally considerably less. The high islands almost invariably have coral reefs around them.

Coral reefs are of three types:—(1) the **fringing reef**, growing close to the shore in shallow water. The inside gets worn and washed away, and the reef grows seaward, gradually changing into (2) the **barrier reef**, lying at some distance from the shore and enclosing a lagoon of still water. (3) An **atoll** is a roughly circular reef with one or more gaps, enclosing a lagoon with no land in the centre. Atolls may be several miles in diameter, but are seldom more than half a mile wide, and never more than from 10 to 20 feet in height. They are often entirely devoid of vegetation except cocoa-nut palms. Many atolls are inhabited; the dwellings are always built on the inside of the reef, facing the lagoon, which is a natural harbour.

With a few exceptions coral islands are only found in **tropical seas**, as the coral polyp only lives in water that has an average temperature of about 70°, with no great variations.

529. Nearly all the "**South Sea Islands**" are in the trade-wind zone. They usually have a very healthy **climate** with abundant rainfall, especially, of course, on the windward side—south-east in the southern islands and north-east in those north of the equator. The staple plants are the **coco-nut** palm and the **bread-fruit** tree. The principal commercial product of almost all the islands is **copra**, the dried kernels of the coco-nut, used for making oil and soap. Sugar, maize, yams, bananas, and other fruits are cultivated on many of the larger islands.

All the islands have been annexed by European powers or by the United States, mostly within the last quarter of the nineteenth century. The whole of Micronesia is German, except the **Gilbert Islands** on the equator (British), and **Guam** (U.S.A.), the largest of the **Ladrone Islands**. In Melanesia the **Bismarck Archipelago** belongs to Germany and the **Solomon Islands** to Britain.

New Caledonia, east of Queensland, is a French convict settlement, with important cobalt and nickel mines, and the **New Hebrides** are under an Anglo-French commission. Germany possesses the greater part of **Samoa**, but some islands of this group belong to the United States, which also possess **Hawaii**.

All the rest of Polynesia is British, except in the extreme south-east, where several groups are under French government. The most important French island is **Tahiti**, in the **Society Islands**, with the port of **Papeete**, nearly on a straight line from New Zealand to Panama.

530. The **Fiji Islands** are the most important British possession in Polynesia. They lie about Lat. 18° S., very nearly on the meridian of 180°. There are two large volcanic islands, **Viti Levu** and **Vanua Levu** (together nearly as large as Wales), and over 200 small islands, of which 80 are inhabited. There are important sugar plantations on the main islands. The capital is **Suva**, on the south coast of Viti Levu.

The **Hawaiian** or **Sandwich Islands**, just south of the northern tropic, are a territory of the United States. The largest island, **Hawaii**, about equal in area to Devon and Cornwall, contains two enormous volcanic cones, Mauna Kea and Mauna Loa, rising nearly 14,000 feet above the sea, or over 30,000 feet from the deep sea-floor around them. Mauna Loa is still active, and besides the crater on its summit has at a much lower level the great crater of **Kilauea**, a lake of lava about three miles in diameter.

The capital and largest town of the Hawaiian group is **Honolulu**, on the island of Oahu, 2,000 miles from San Francisco, and 3,500 miles from Yokohama. It is a very convenient calling place for steamers from the west of North America to China, Japan, Australia, or New Zealand. The chief products of the islands are **sugar** and **rice**. The population consists chiefly of Japanese, Chinese, and Europeans. The native Hawaiians form less than one-fifth of the total, and, like nearly all the island races of the Pacific, are dying out.

CHAPTER XX.

THE BRITISH EMPIRE AND BRITISH COMMERCE.

GENERAL.

531. The British Empire covers an area of nearly 12 million square miles, or more than **one-fifth** of the land surface of the world. Its population of nearly 400 million is also more than one-fifth of the total population of the world.

The British is sharply distinguished from the Russian and Chinese Empires, which are the next in size and population, by its **oceanic** character and wide distribution in all the continents. Except in South Africa, there are hardly any two separate colonies between which communication is not easier by sea than by land, and the majority of the colonies are entirely insular.

The British Empire is also distinguished from all other empires, past and present, by the great variety and elasticity of its **administration**, forming a strong contrast to the extreme centralisation which was a source of weakness to the vanished Roman and Spanish Empires, and probably is to the Russian Empire of to-day, in spite of its compactness.

The **self-governing** British colonies are for all practical purposes independent nations, though owning allegiance to the English Crown; and even the "**Crown Colonies,**" which are directly under the rule of the home government, are administered for their own benefit and not for that of the mother country, which, at any rate in time of peace, derives no direct benefit from its colonies, but on the contrary spends large sums annually on their administration and economic development.

POSITION AND AREA.

532. Of the total area of the Empire nearly 2 million square miles are in Asia, 2·6 million in Africa, about 4 million in America, and 3·2 million in Australasia. The European possessions are small in area, but two of them, **Gibraltar** and **Malta,** are of great strategical importance as "stepping-stones" to the East.

INDIA.

533. The **Indian Empire** is administered by a special department of the home government under the charge of a **Secretary of State.** Executive authority in India is exercised by a Governor-General or **Viceroy,** assisted by a **Legislative Council,** nominated partly by the Crown and partly by the Viceroy. Thus the government of India is quite autocratic in character, and all the higher officials are British.

The native or **feudatory** states, however, occupying about one-third of the total area, and containing one-fifth of the population, are not directly under British rule. Their princes nominally enjoy considerable powers, but are not allowed any diplomatic relations with other states, or any military forces above a fixed limit; and they are controlled in varying degrees by **residents** or agents appointed by the Viceroy.

534. "British India," *i.e.* that part directly governed by the Viceroy, is divided into **nine provinces**:—**Madras,** Bombay, Bengal, Eastern Bengal and Assam, the United

Provinces (Agra and Oudh), the Panjab, the North-West Frontier Province, the Central Provinces, and Burma. The chief native states are Hyderabad, Mysore, Travancore, Gwalior, Patiala, Kashmir, and the numerous states of Rajputana.

Ceylon, though geographically part of India, is a separate Crown Colony.

OTHER COLONIES.

535. According to *The Statesman's Year-Book* the Colonies, exclusive of India, form three classes:—"(1) The *Crown Colonies*, which are entirely controlled by the home government; (2) those possessing *Representative Institutions*, in which the Crown has no more than a veto on legislation, but the home government retains the control of public officers; and (3) those possessing *Responsible Government*, in which the home government has no control over any public officer, though the Crown appoints the Governor and still retains a veto on legislation."

These may be summarised as Colonies possessing (1) no self-government, (2) partial self-government, (3) complete self-government. To these may be added (4) the "**Protectorates**" and "**Spheres of Influence**," in which British administration, so far as it exists at all, is for the most part restricted to the task of keeping the peace.

536. In the following tables the chief British possessions, apart from India, are arranged in three classes, not geographically, but according to **methods of government**. The arrangement has, however, some geographical significance, as almost all the self-governing colonies are in the temperate zone, while nearly all the Crown Colonies are in the tropics. Except for three small islands, one of which (Cyprus) is technically not a British possession, but Turkish, the colonies with partial self-government are in the West Indies or the adjacent mainland of America.

The figures of population refer to about the year 1905, as far as they can be ascertained, but in some cases they are merely estimates.

I. SELF-GOVERNING COLONIES.

	Area 1,000 square miles.	Population 1,000's.	Capital.	Population 1,000's.	Leading exports.
A. AUSTRALASIA.					
New South Wales	310	1,462	Sydney	500	Gold, **wool**, silver, meat.
Victoria	88	1,210	Melbourne	510	**Gold**, **wool**, wheat, wine.
Queensland	668	522	Brisbane	130	Metals, meat, hides.
South Australia	904	373	Adelaide	175	**Wool**, **wheat**, copper.
Western Australia	976	243	Perth	50	**Gold**, timber, pearls.
Tasmania	26	180	Hobart	25	Fruit, metals, wool.
Commonwealth of Australia	2,972	3,990	—	—	**Wool**, **gold**.
Dominion of New Zealand ...	105	856	Wellington*	50	**Wool**, mutton, butter.
B. AFRICA.					
Cape Colony	277	2,123	Cape Town	170	Diamonds, **wool**, ostrich **feathers**.
Natal	35	1,109	Pietermaritzburg*	32	Coal, wool.
Orange River Colony ...	50	387	Bloemfontein	35	Wool, diamonds.
Transvaal	118	1,354	Pretoria*	40	**Gold**, diamonds.
C. NORTH AMERICA.					
Newfoundland	40	223	St. John's	30	Cod, fish oils, iron ore.
Dominion of Canada ...	3,745	5,371	Ottawa*	60	**Wheat**, **timber**, cheese, butter, cattle.

* In these colonies the capital is not the largest town.

II. COLONIES WITH PARTIAL SELF-GOVERNMENT.

	Area 1,000 square miles.	Population 1,000's.	Capital.	Population 1,000's.	Leading productions.
Malta	·12	202	Valetta	23	Fruit and vegetables.
Cyprus	3·6	237	Nicosia	15	Cereals, fruit, cotton.
Mauritius	·7	374	Port Louis	53	Sugar.
Bermuda	·02	20	Hamilton	2	Vegetables.
British Guiana	90	278	Georgetown	55	Sugar, gold.
Bahamas	4·4	57	Nassau	5	Sponges, fruit, hemp.
Barbados	·17	200	Bridgetown	35	Sugar.
Jamaica	4·4	800	Kingston	50	Sugar, rum, bananas, coffee.
Leeward Islands	·7	130	St. John (Antigua)	10	Sugar, fruit, coffee.
Windward Islands	·5	167	St. George's (Grenada)	5	Cacao, sugar.
Trinidad and Tobago	1·8	310	Port of Spain	5	Cacao, sugar, pitch.

III. CHIEF CROWN COLONIES.

	Area 1,000 square miles.	Population 1,000's.	Capital.	Population 1,000's.	Leading productions.
Gibraltar	·002	20	—	—	—
Aden	·075	45	—	—	—
Ceylon	25	3,813	Colombo	160	**Tea**, rice, coco-nuts, plumbago.
Straits Settlements ...	1·5	600	Singapore	200	**Spices**, rice, sugar.
Hong Kong	·035	350	Victoria	190	—
British New Guinea ...	90	350	Port Moresby	—	Gold, timber, sago.
Fiji	7·7	122	Suva	—	Sugar, coco-nuts.
Lagos...	25	1,500	Lagos	42	Palm oil and kernels, rubber, nuts.
Gold Coast	71	1,400	Accra	15	
Sierra Leone	34	1,000	Freetown	34	
Gambia	3	164	Bathurst	8	
British Honduras	7·5	40	Belize	10	Mahogany, bananas.

PROTECTORATES.

537. The chief **Protectorates** are in Africa; the largest and most populous of them being **Nigeria**, with an area nearly three times that of the British Isles and an estimated population of 13 millions. The other Protectorates in Africa are Basutoland, Bechuanaland, the Central Africa Protectorate, the East Africa Protectorate, Zanzibar, Uganda, and British Somaliland. In Asia the principal Protectorates are the **Federated Malay States** (Perak, Selángor, Negri Sembilan, and Pahang), and **Sarawak** in Borneo.

The south of **Persia** was in 1907 officially announced as being in the British "sphere of influence." This means no more (at present) than the keeping of an "open door" for the commerce of the Persian Gulf.

British North Borneo and **Rhodesia** are at present administered by Chartered Companies. Their primary object is trade, and they only acquired territory incidentally as a means of security. This state of affairs is apt to be transitory, as is shown by the history of the East India Company, the Hudson Bay Company, and the Royal Niger Company, all of which ultimately transferred their territories to the Imperial government.

DEFENCE.

538. The chief colonies in which considerable garrisons of Imperial troops are kept are Gibraltar, Malta, Aden, Mauritius, Bermuda, Ceylon, the Straits Settlements, and Hong Kong. The British army in India numbers about 75,000 men, and a few thousand British troops are kept in Egypt.

Of the garrison stations abroad it may be noted that Gibraltar, Malta, Egypt, and Aden are on the road from England to India, the only important part of the Empire, except Canada, which might conceivably be attacked by land.

Mauritius and Bermuda are centrally placed for the control of the Indian Ocean and the western North

Atlantic respectively. Mauritius is nearly equidistant from Cape Colony and Ceylon, and Bermuda from Canada and the West Indies. The importance of Singapore and Hong Kong is more commercial than strategic.

COLONIES AS MARKETS.

539. Of the larger British possessions, **India**, with its almost wholly agricultural population of nearly 300 millions, affords the largest market for the manufactured goods of the home country, taking especially cotton goods, metals, and machinery.

Next in importance as a market comes **Australia**, with a population almost wholly devoted to sheep-rearing, agriculture, and mining, or engaged in export trade, and therefore requiring all kinds of manufactures.

Canada, which has a considerably larger population, also engaged in primary production, buys much less from England, owing to the fact that it has the great manufacturing region of the States at its doors. Canada is, however, unsurpassed among British colonies as a field for emigration. Though its population is as yet hardly greater than that of London, it is certainly capable of supporting more people than the whole of the mother country.

The tropical colonies, as a rule, are already densely inhabited by coloured races, and many of them are climatically unfit for white labour. The **South African** colonies, though generally healthy, are on the whole somewhat barren, and their attractiveness to English people is diminished by acute racial problems which have nothing to do with geography.

BRITISH INDUSTRY AND COMMERCE.

Occupations.

540. In the last 50 years the number of persons engaged in **agriculture** in the United Kingdom has diminished by about 50 per cent., though agriculture still occupies more people than any other single branch of industry, the total number directly employed being about one million in England and Wales, 200,000 in Scotland, and 800,000 in Ireland, which, with only one-seventh of the population of England, employs nearly as many people in agriculture.

541. The group of **textile** industries directly employs over a million people, of whom considerably more than half are cotton workers. The number of persons employed in **woollen** manufacture is no greater now than it was 50 years ago and the silk industry has almost vanished, but both the **cotton** and **linen** manufactures have grown fairly steadily.

After textile manufactures the most important English industries, measured by the number of persons employed, are the **building** trades, **coal-mining**, **iron** and **steel** manufacture, **machine-making** and **ship-building**, tailoring, boot-making, and printing.

Nearly half a million people are occupied on British **railways**, and considerably over a million altogether are engaged in transport—railways, roads, canals, docks, etc.; at least an equal number are employed in purely commercial work or in administration (national and local government).

Foreign Trade.

542. The total **foreign** trade of the United Kingdom is much greater than that of any other country, though in recent years the export trade of the United States has become nearly equal to that of the United Kingdom. But United States imports are much smaller. Broadly, apart from the important **entrepôt** trade of London, the foreign trade of this country is summed up in the statement that it **imports food and raw materials**, and **exports coal and manufactured articles.**

Ireland has hardly any direct foreign trade, nearly all its imports and exports going through England, which has over 90 per cent. of the total foreign trade of the kingdom.

The eight leading ports of the United Kingdom are, in order of the total tonnage of ships entering:—London, Liverpool, Cardiff, the Tyne Ports, Hull, Glasgow, Southampton, and Dover.

A list in this order is, from the point of view of foreign commerce, misleading to some extent: thus Cardiff, which ranks third, has a trade insignificant in value compared with that of some other ports with less tonnage, owing to the fact that its chief export, coal, is a bulky article requiring large tonnage for its transport. The same remark applies, to a less extent, to the Tyne Ports and Hull.

Southampton and Dover, apart from their considerable trade with France, are important only as passenger ports, and have no industrial hinterland. London and Liverpool stand in a class by themselves as the two great commercial gateways of Britain.

Imports.

543. The following tables give the principal imports of food and raw materials into the United Kingdom, with the chief countries from which they come, arranged approximately in order of importance. The exact order naturally varies to some extent in different years, especially in agricultural products. Thus the imports of Indian and Australian wheat, which are very large in some years (together 30 per cent. of the whole in 1905), diminish in others almost to zero.

In connexion with wheat, the last 30 years have been marked by a considerable decrease in the wheat grown at home, a great decrease in the wheat imported from Europe into Britain, and a still greater increase in the wheat imported from North America, Argentina, India, and Australia. Imports of U.S.A. wheat, however, have diminished considerably since 1900.

Articles of food and drink and raw materials (principally textile fibres, timber, and ores) amount to about three-quarters of the total imports of the United Kingdom.

IMPORTS INTO THE UNITED KINGDOM.

I. Food.

ARTICLES.	PRINCIPAL SOURCES.
Wheat and Flour	U.S.A., Canada, Russia, India, Argentina, Australia (Victoria and South Australia).
Barley and Oats	Russia, Rumania.
Maize	Rumania, Argentina.
Rice	Burma.
Meat (including live animals)	U.S.A., Argentina, Denmark, New Zealand, Canada.
Butter	Denmark, France, Russia.
Cheese	Canada, U.S.A., Holland.
Eggs	Russia, Denmark, Germany.
Fruit	Spain (oranges, grapes, etc.), U.S.A. (oranges, apples), Greece (currants), British West Indies (bananas, pineapples, etc.).
Sugar	Germany, France (beet-sugar), British West Indies (cane-sugar).
Tea	India, Ceylon, China.
Cocoa	British West Indies, Ecuador.

II. Raw Materials.

ARTICLES.	PRINCIPAL SOURCES.
Raw Cotton	U.S.A., Egypt, Brazil, India.
Raw Wool	Australia, New Zealand, Cape Colony.
Flax	Russia.
Hemp	Philippine Islands, New Zealand.
Jute	India.
Timber	Russia, Canada, Sweden, U.S.A., Norway, Australia, British Honduras.
Palm Oil	British West Africa.
Oil Seeds	India, Egypt, Argentina.
Petroleum	U.S.A., Russia.
Rubber	Brazil, Ceylon, Straits Settlements.
Iron Ore	Spain, Sweden.
Copper Ore	Spain, Chile.
Tin	Straits Settlements, Chile, Australia.

Exports.

544. The exports from the United Kingdom are considerably less in value than the imports. About three-quarters of the total value of the exports consist of articles manufactured or partly manufactured.

Considerably more than half the exports consists of two classes of goods: (1) **textile fabrics**—cotton, wool, linen, and jute, in order of value; (2) **machinery** and **metal manufactures**—hardware, cutlery, ships, tin-plate, steel rails, etc.

About one-seventh of our total export of manufactures goes to India, and nearly one-third to other British possessions. Of these Australia and New Zealand take by far the largest share, followed at a considerable distance by Canada, which gets most of its manufactured goods from U.S.A.

The chief **foreign** countries which import British manufactures on a large scale are Germany, U.S.A., and France. British manufactures are so widely scattered that no account of their destinations can be given here; but it may be noted that U.S.A. is a specially important customer for woollen, linen, and jute fabrics, while manufactured cotton goes principally to tropical countries, especially to India and China.

Coal, which is the only raw material of British origin largely exported, goes mainly to France, to Italy, and other Mediterranean countries, and to the Baltic countries. The most important deposit of anthracite in Europe is in South Wales, and hence Welsh coal is in universal demand for steamships.

Entrepôt Trade.

545. About one-fifth of the total value of exports from the United Kingdom consists of foreign and colonial produce brought to England from all parts of the world and thence distributed again. The chief articles of this *entrepôt* trade, which is almost wholly centred in London, are, in approximate order of value, raw wool, raw cotton, rubber, coffee, leather, tea, and tin.

London was until lately the chief wool market, not only for England, but for all Europe. But, though wool is still at the head of the above list, the *entrepôt* wool trade has been diminishing for some time, owing to the increase of shipping facilities in continental ports, and the consequent saving of a transhipment of goods.

The *entrepôt* cotton trade is also stationary or decreasing, the vast scale of modern industry rendering it more practicable for the manufacturer to buy direct from the producer, without the aid of Manchester and Liverpool brokers. These considerations, however, do not apply so much to articles of high value and small bulk, like rubber, coffee, tea, and tin, the trade in all of which is still largely centred in London.

APPENDIX A.

FORMS OF GOVERNMENT.

THE countries of the world can be divided into three classes:—(1) **monarchies**, governed by an hereditary sovereign; (2) **republics**, in which the head of the State is elected, directly or indirectly, by the people, generally for a fixed term of years; (3) **colonial** possessions.

(1) Monarchies are either **absolute** (*i.e.* the will of the sovereign is paramount), as in Russia, or are **limited** by the power of elected assemblies, as in Great Britain and Ireland. Almost all civilised monarchies of the present day (Turkey and China are the only important exceptions) have at least the forms of parliamentary government, but in most European states the sovereign has more power of initiative than he has in the United Kingdom. Russia is still, in all essentials, a "**despotism** tempered by anarchy."

The German Empire and the Austro-Hungarian Empire differ from all the other monarchies of Europe. Germany is a **confederation** of twenty-five states which, while united for purposes of defence or aggression, are in the management of their own affairs entirely independent under their own hereditary rulers. The **German Emperor** (not Emperor of Germany) is head of the executive, and there is an Imperial Parliament. This consists of two bodies, the *Bundesrath* or Federal Council, the members of which are appointed annually by the governments of the various states, and the *Reichstag*, the members of which are elected by universal suffrage, and hold office for three years.

Austria-Hungary is also a **confederation**, but of a different kind from Germany, and the bond between the different parts of the empire is by no means so strong as in the latter country. The Emperor rules as **emperor** in Austria and as **king** in Hungary. Each country has its own laws, parliament, and government, and manages its own affairs. For imperial purposes there exists a body called the *Delegations*, a permanent committee, the members of which are elected in equal numbers by the parliaments of the two countries. The acts of the Delegations are subject to the approval of both parliaments, the *Reichsrath* in Austria, the *Reichstag* in Hungary. Austria itself is made up of a number of states differing widely in race and language, which are held together only with great difficulty. Each province has its own *Diet* or assembly to manage provincial affairs.

(2) **Republics** are mainly of two kinds. France is the only important representative of one type, in which there is a highly centralised national government, and local authorities have little power. At the other end of the scale are the "**federal republics**," of which Switzerland is the oldest surviving example, and the United States the most important. The federal republics, in somewhat the same way as the German Empire, are confederations of semi-independent states, united for certain common purposes, but each retaining considerable freedom within its own boundaries. It is a common difficulty of federal republics to adjust without too much friction the respective powers and functions of the central and the local governments. The United States, since it became a world-power, has been confronted with certain grave problems arising from the weakness of the control exercised by the central government at Washington over the various state governments.

(3) The **colonial possessions** of most powers are ruled more or less despotically by officials acting under the orders of the home government. **Algeria** is, however, treated for many purposes as a part of France, and sends representatives to the French Chambers.

It is only within the British Empire, and in modern times, that **self-governing colonies** are met with (see Chapter XX.). These colonies are in a singularly favourable situation, as they have practically complete internal freedom, while the cost of defence is almost entirely borne by the home government.

APPENDIX B.—STATISTICS.

THE UNITED KINGDOM.

Area and Population.

	Area. Square Miles.	Population, 1901. Millions.	Percentage Area.	Percentage Population.
England and Wales	58,300	32·50	48	78
Wales	7,400	1·75	6	4
Scotland	30,400	4·47	25	11
Ireland	32,400	4·46	27	11
Isle of Man	227	0·05	—	—
Channel Islands	75	0·10	—	—
United Kingdom	121,400	41·58	100	100

Principal Towns.

England.

	Population about 1907, in thousands.
London (County)	4800
"Greater London"	7200
Manchester with Salford	880
Liverpool with Birkenhead	860
Birmingham	550
Leeds	470
Sheffield	460
Bristol	370

	Population about 1907, in thousands.
Bradford	290
Newcastle	270
Hull	270
Nottingham	260
Leicester	240
Portsmouth	210
Plymouth - Devonport	200
Cardiff	190

Other Towns with more than 100,000 Inhabitants.

- Blackburn
- Bolton
- Brighton
- Burnley
- Derby
- Gateshead
- Halifax
- Middlesbrough
- Norwich
- Oldham
- Preston
- Southampton
- South Shields
- Stockport
- Sunderland
- Wolverhampton

Scotland.

	Population in thousands.
Glasgow	850
Edinburgh	350
Aberdeen	175
Dundee	165
Paisley	90
Leith	82
Greenock	70

Ireland.

	Population in thousands.
Dublin	380
Belfast	350
Cork	76
Londonderry	40
Limerick	38
Waterford	27

Production.

(Averages, 1902-5.)

	GREAT BRITAIN.	IRELAND.
CEREALS.	Million Bushels.	Million Bushels.
Wheat	50	1·3
Barley	60	6·3
Oats	125	50
ROOT CROPS.	Million Tons.	Million Tons.
Potatoes	3·3	2·8
Turnips and Swedes	22	4·6
ANIMALS.	Millions.	Millions.
Horses	1·6	·5
Cattle	6	4·7
Sheep	25	3·7
Pigs	2·5	1·2

Annual Value of Minerals.

(United Kingdom.)

	Million £.
Coal	84
Iron ore (value as iron)	13
Clay	From 1 to 2 million each.
Sandstone	
Slate	
Limestone	
Granite	
Salt	0·6
Oil shale	0·55
Tin ore	0·5
Zinc ore	0·25
Lead ore	0·25

Commerce.

Average Values, 1903-5.

IMPORTS.

	Million £.
Grain and flour	70
Raw cotton	51
Meat and animals for food	48
Timber	25
Metals and metal manufactures	25
Butter and margarine	23
Raw wool	22
Sugar	18
Silk manufactures	13
Fruits and hops	13
Flax, hemp, and jute	12
Woollen manufactures	12
Oils	10·5
Tea	9·5
Ores (chiefly iron and copper)	9

EXPORTS.

	Million £.	
Cotton manufactures	83	
Iron and steel (rails, wire, pig iron, tin-plate, etc.)	30	62
Machinery, cutlery, etc.	27	
Ships	5	
Coal	27	
Woollen manufactures	24	
Linen ,,	7	
Clothes, etc.	8	
Jute manufactures	2·6	
Foreign and colonial produce re-exported—raw wool, coffee, cocoa, tea, rubber, tin, etc.		73

Tonnage of Ships

Entered and Cleared at Various Ports, 1905.

	Million Tons.		Million Tons.
London	17·6	Hull	4·5
Liverpool	14·3	Glasgow	4·2
Cardiff	12·8	Southampton	4·0
Tyne ports	8·5	Dover	3·5

Foreign Trade

Of the Chief Commercial Countries.

AVERAGE ANNUAL VALUES, 1902-5.

Country.	Imports Million £.	Exports Million £.	Total Million £.
United Kingdom	547	372	919
Germany	330	261	591
United States	202	284	486
France	231	221	452
Holland	186	156	342
India	92	114	206
Belgium	107	84	191
Russia	67	104	171
Italy	73	60	133
Canada	50	43	93
Australia	39	50	89
China	45	30	75

COUNTRIES OF EUROPE.

The "Great Powers."

Country.	Nature of Government.	Area. Sq. Miles.	Population. Millions.	Capital.	Population. Thousands.	Chief Exports.	Chief Imports.
France	Republic	207,000	39	Paris	2,700	**Wine**, textiles, *articles de Paris*	Raw wool, cotton, and silk; coal; oil-seeds; timber
Germany	Federal Empire	209,000	60	Berlin	2,000	**Sugar**; metal and wood manufactures; textiles	Textiles; machinery; coal
Chief States of Germany:							
Prussia	Kingdom	135,000	35	Berlin	2,000		
Bavaria	Kingdom	29,000	6·2	Munich	500		
Württemburg	Kingdom	7,500	2·2	Stüttgart	177		
Saxony	Kingdom	5,800	4·2	Dresden	400		
Baden	Grand Duchy	5,800	1·9	Karlsruhe	100		
Alsace-Lorraine	Imperial Province	5,600	1·7	Strassburg	151		
Russia	Empire	8,600,000	130	St. Petersburg	1,300	**Wheat**, barley, eggs, **timber**, **flax**, oil	Raw cotton, tea, iron, machinery
In Europe		2,100,000	110				
In Asia		6,500,000	19				
Austria-Hungary	Dual Empire-Kingdom	241,000	48	Vienna	1,700		
Austria	Empire	116,000	27	Vienna	1,700	Sugar, eggs, cattle, glass, woodwork	Raw cotton and wool, coal, machinery
Hungary	Kingdom	125,000	21	Buda-Pest	730	**Wheat** and **flour**, cattle	Textiles, coal
Italy	Kingdom	111,000	34	Rome	470	**Raw silk**; cotton and silk manufactures; olive oil, hemp, flax, sulphur, wine	Raw cotton and wool, coal, grain, machinery, timber

Minor Countries of Western Europe.

Country.	Nature of Government.	Area. Sq. Miles.	Population. Millions.	Capital.	Population. Thousands.	Chief Exports.	Chief Imports.
Spain ...	Kingdom	190,000	19	Madrid	540	Ores of **iron, copper,** and lead; wine, fruits	Coal, machinery, textiles
Portugal ...	Kingdom	35,000	5·5	Lisbon	360	**Wine,** cork, fish, fruits, copper ore	Coal, cotton, iron, fish, wheat
Switzerland ...	Federal Republic	16,000	3·5	Berne	70	Silk and cotton manufactures, **clocks** and **watches,** cheese, condensed milk	**Raw** silk and cotton, coal, iron, food stuffs
Belgium ...	Kingdom	11,000	7·2	Brussels	600	Coal, machinery, iron wares, linen *	Wheat, raw wool, flax *
Holland (The Netherlands)	Kingdom	13,000	5·5	The Hague	240	Butter, margarine, cheese *	Iron and steel, textiles, grain, coal *
Denmark ...	Kingdom	15,000	2·7	Copenhagen	480	**Butter,** eggs, meat	Coal, textiles, grain, metals, hardware
Norway ...	Kingdom	124,000	2·5	Christiania	230	**Wood** and wood pulp, fish, animal produce	Food stuffs, textiles, coal, machinery
Sweden ...	Kingdom	173,000	5·4	Stockholm	320	**Wood** and wood pulp, **iron ore,** animal produce	Textiles, raw and manufactured; food stuffs, coal, machinery

* A considerable proportion of the foreign trade of Germany passes through Holland and Belgium. This is not included here.

The Balkan States.

Country.	Nature of Government.	Area. Sq. Miles.	Population. Millions.	Capital.	Population. Thousands.	Chief Exports.	Chief Imports.
Rumania ...	Kingdom	51,000	6·4	Bucharest	280	**Wheat**, **maize**, fruit, wood	Textiles, metal manufactures, coal
Servia ...	Kingdom	19,000	2·7	Belgrade	70	Cereals, fruit, animals (especially pigs)	
Bulgaria * ... (with Eastern Rumelia) ...	Principality	38,000	3·8	Sofia Philippopolis	70 43	Wheat, animal produce, attar of roses	
Montenegro ...	Principality	3,600	·25	Cettinjé	3	Animal and dairy produce	
Turkey ...	Empire	1,165,000	24·1	Constantinople	1,100	Barley, **raisins**, figs, goats' hair, wool,† dates (Tripoli)	
In Europe		65,000	6·2				
In Asia		700,000	16·9				
In Africa ‡		400,000	1·0				
Greece ...	Kingdom	25,000	2·7	Athens	112	**Currants**, wine, iron ore, olives and olive oil, fruits	

* Nominally under Turkish suzerainty ; practically independent.

† Principally from Asia Minor. No modern statistics available.

‡ Not including Egypt, which is nominally Turkish.

Large Towns in Europe.

(Not including the Capitals given in the above Tables.)

	Population. Thousands.
FRANCE.	
Marseilles	490
Lyons	460
Bordeaux	260
Lille	210
GERMANY.	
Hamburg	870
Leipzig	460
Breslau	420
Cologne	370
Elberfeld-Barmen	300
Frankfurt-am-Main	290
Nuremberg	260
Hanover	240
Essen	230
Magdeburg	230
Düsseldorf	215
Stettin	210
Chemnitz	210
RUSSIA IN EUROPE.	
Moscow	1100
Warsaw	760
Odessa	450
Lodz	350
RUSSIA IN EUROPE—(*cont.*)	
Kiev	320
Riga	280
Kharkov	200
AUSTRIA.	
Prague	200
ITALY.	
Naples	570
Milan	490
Turin	340
Palermo	310
Genoa	235
Florence	205
SPAIN.	
Barcelona	533
Valencia	210
BELGIUM.	
Antwerp	300
HOLLAND.	
Amsterdam	550
Rotterdam	370

Towns in Europe

with between 100,000 and 200,000 Inhabitants.

(Not including Capitals.)

FRANCE.
- Toulouse
- St. Etienne
- Roubaix
- Nantes
- Le Havre
- Rouen
- Reims
- Nice
- Nancy
- Toulon

GERMANY.
- Königsberg
- Charlottenburg
- Bremen
- Altona
- Halle-on-Saal
- Dortmund
- Mannheim
- Danzig
- Aachen
- Brunswick
- Posen
- Kiel
- Krefeld
- Kassel

RUSSIA (in Europe).
- Vilna
- Kazan
- Saratov
- Yekaterinoslav
- Kishinev
- Astrakhan
- Byelaya Tserkov
- Rostov-on-Don
- Tula
- Helsingfors

AUSTRIA.
- Lemberg
- Gratz
- Trieste
- Brünn

HUNGARY.
- Szeged

ITALY.
- Bologna
- Venice
- Messina
- Catania
- Leghorn

SPAIN.
- Seville
- Malaga
- Murcia
- Carthagena
- Saragossa

PORTUGAL.
- Oporto

SWITZERLAND.
- Zürich
- Basel
- Geneva

BELGIUM.
- Liège
- Ghent

HOLLAND.
- Utrecht

SWEDEN.
- Göteborg

TURKEY (in Europe).
- Salonica

NORTH AMERICA.

Country.	Nature of Government.	Area. Sq. Miles.	Population. Millions.	Capital.	Population. Thousands.	Chief Exports.	Chief Imports.
Dominion of Canada ...	Self - governing British colony	3,745,000	5·4	Ottawa	60	Wood and woodwork, wheat, cheese, cattle, gold	Iron and steel, machinery, coal, textiles
United States of America	Federal Republic	3,560,000 (including Alaska, 590,000)	80	Washington	293	Raw cotton, wheat, meat, dairy produce, iron, steel, and copper manufactures, mineral oils, wood	Sugar, skins, coffee, silk and cotton goods, raw wool, rubber, hemp
Mexico ...	Federal Republic	767,000	14	Mexico	350	Silver, copper, gold, henequen (hemp)	Textiles, machinery, coal

Large Towns of North America.

(Not including Capitals.)

Canada.

	Population. Thousands.
Montreal	270
Toronto	210
Quebec	69
Hamilton	53
Winnipeg	42
Halifax	41

United States.

	Population. Thousands.
New York	3,720
Chicago	1,875
Philadelphia	1,370
St. Louis	612
Boston	600
Baltimore	530
Cleveland	415

United States—(*continued*).

	Population. Thousands.
Buffalo	380
San Francisco	360
Pittsburg	345
Cincinnati	333
Milwaukee	312
Detroit	310
New Orleans	300
Newark	265
Jersey City	220
Louisville	215
Minneapolis	214

And about 20 other towns with more than 100,000 inhabitants.

CENTRAL AMERICA.

Country.	Area. Sq. Miles.	Population. Millions.	Capital.	Population. Thousands.	
British Honduras	7,500	·04	Belize	9	Exports : bananas and coffee Imports : textiles and foodstuffs
Guatemala	48,000	1·8	Guatemala	97	
Honduras	46,000	·75	Tegucigalpa	35	
Salvador	7,200	1·0	San Salvador	60	
Nicaragua	49,000	·5	Managua	30	
Costa Rica	18,000	·33	San José	25	
Panama	3,200	·34	Panama	28	

SOUTH AMERICA.

	Area Sq. Miles.	Population. Millions.	Capital.	Population. Thousands.	Chief Productions.
Colombia	500,000	3·9	Bogotá	120	Coffee, wheat, rice, gold, silver
Ecuador	116,000	1·4	Quito	80	**Cocoa**, quinine, rubber, gold
Peru	696,000	4·0	Lima	130	Cotton, coffee, sugar, wool, guano, rubber
Bolivia	700,000	2·0	Sucre	21	Cereals, rubber, silver, tin
Chile	300,000	3·2	Santiago	335	**Nitrate**, copper, cereals, wine
Argentine Republic ...	1,136,000	5·5	Buenos Aires ...	1,100	**Wool**, wheat, maize, meat, hides
Uruguay	72,000	1·0	Montevideo	250	**Meat**, wool, cereals
Paraguay	157,000	·6	Asuncion	50	Maté, oranges, timber, tobacco
Brazil	3,200,000	14·0	Rio de Janeiro ...	800	**Coffee**, sugar, cotton, tobacco, rubber, timber, nuts, cocoa
French Guiana	30,000	·033	Cayenne	13	Gold, cocoa
Dutch Guiana	46,000	·075	Paramaribo ...	32	Sugar, cocoa, gold
British Guiana	90,000	·28	Georgetown ...	53	Gold, sugar
Venezuela	364,000	2·6	Carácas	73	Coffee, sugar, cattle, gold, copper

ASIA.

Country.	Area. Sq. Miles.	Population. Millions.	Principal Towns. Population in Thousands.
Russia in Asia ...	6,500,000*	19	
Trans-Caucasia ...	96,000	5·6	Baku 180, Tiflis 160
Siberia	4,800,000	5·7	Tomsk 64, Irkutsk 50
Steppes and Turkestan	1,325,000	7·7	Tashkend 156, Kokand 87
Japan (Nippon) ...	148,000	48	Tokyo 1,818, Osaka 1,000, Kioto 380, Yokohama 330, Nagoya 290, Kobé 285, Nagasaki 153
Korea	82,000	10-12	Seoul 200
China	4,150,000	433†	
China proper ...	1,500,000	407†	Pekin 1600, Siangtan 1,000, Singan 1,000, Canton 900, Hankau 870, Tientsin 750, Shanghai 650, Fuchau 620, Chungking 600, Suchau 500, Hangchau 300, Nanking 270 [Estimates only]
Dependencies (Manchuria, Mongolia, Tibet, Chinese Turkestan)	2,650,000	26†	
French Indo-China (Annam, Cambodia, Cochin China, Tonking, Laos)	256,000	21	Hanoi 150, Hué 50, Saigon 48
Siam...	220,000	6	Bangkok 500
Straits Settlements and Federated Malay States	27,000	1·3	Singapore 230

* Including internal waters (Caspian, Aral Sea, etc.).

† Chinese estimate, probably too high.

ASIA—(continued).

Country.	Area. Sq. Miles.	Population. Millions.	Principal Towns. Population in Thousands.
Dutch East Indies...	736,000	36	Batavia 120, Soerabaya 150
Indian Empire ...	1,720,000	295	Calcutta 1,026, Bombay 776, Madras 510, Haidarabad 450, Lucknow 265, Rangoon 235, Benares 210, Delhi 210, Lahore 205, Cawnpore 200
British Provinces	1,087,000	232	
Native States ...	633,000	63	
Afghanistan ...	250,000	5	Kabul, Kandahar
Persia	628,000	9·5	Teheran 280, Tabriz 200
Turkey in Asia ...	694,000	17	
Asia Minor ...	194,000	9	Smyrna 200
Armenia and Kurdistan ...	72,000	2·5	Erzerum 40
Mesopotamia ...	143,000	1·4	Bagdad 145
Syria	115,000	2·9	Damascus 230, Aleppo 127, Beyrut 120
Arabia	170,000	1·1	Mecca 60

AFRICA.

Country.	Area. Sq. Miles.	Population. Millions.	Principal Towns. Population in Thousands.
British Africa.			
Cape Colony ...	277,000	2·5	Cape Town 170, Kimberley 35, Port Elizabeth 33
Natal	35,000	1·1	Durban 70, Pietermaritzburg 32
Basutoland ...	10,300	·35	Maseru 1
Bechuanaland ...	386,000	·12	Palachwe 25
Orange River Colony	50,400	·4	Bloemfontein 35
Transvaal ...	111,000	1·25	Johannesburg 160, Pretoria 21
Rhodesia	432,000	1·4	Salisbury, Bulawayo
British Central Africa (Nyasaland)	41,000	1·0	Blantyre
Brit. East Africa	1,000,000	8	Zanzibar 60, Mombasa 25
Brit. Somaliland	60,000	·3	Berbera 30
Nigeria	310,000	25	Lagos 42, Calabar, Akassa
Gold Coast ...	82,000	1·5	Accra 15, Cape Coast Castle 30
Gambia	3,000	·17	Bathurst 9
Sierra Leone ...	34,000	1·1	Freetown
Egypt	400,000 (Inhabited area only 13,000)	10	Cairo 570, Alexandria 320, Tantah 57, Port Said 42, Assiut 42
Anglo - Egyptian Sudan	950,000	2	Khartum 14, Omdurman 40
Tripoli (Turkish) ...	400,000	1	Tripoli 30
Abyssinia	150,000	3·5	Adis Abeba 35, Harar 40
Liberia	45,000	2	Monrovia 5
Morocco	220,000	5	Fez 140, Tangier 30
Congo Free State (Belgian)	900,000	30	Boma, Matadi, Leopoldville

AFRICA—(continued).

Country.	Area. Sq. Miles.	Population. Millions.	Principal Towns. Population in Thousands.
French Africa.			
Algeria	185,000	5	Algiers 140, Oran 90
Tunis	51,000	2	Tunis 250
French West Africa and Sahara (Sahara, Senegal, Guinea, Ivory Coast, Dahomey, Upper Senegal-Niger)	1,540,000	15	Dakar 18, St. Louis 24, Timbuktu, Abomey
French Congo	450,000	8-15	Loango
French Somaliland	12,000	·05	Jiboutil 15
Madagascar	224,000	3	Antananarivo 55
German Africa.			
Togoland	34,000	1·5	Lome
Kamerun	191,000	3·5	Buëa
German South-West Africa	322,000	·2	Windhoek
German East Africa	384,000	7	Dar-es-Saláam 13
Portuguese Africa.			
Portuguese Guinea	14,000	·8	Bolama
Angola	485,000	4·2	S. Paulo de Loanda
Portuguese East Africa	294,000	3·2	Lorenço Marques 10, Beira, Mozambique, Chinde
Italian Somaliland (Eritrea)	100,000	·45	Massawah 1·2

For Australasia see Chapter XX.

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(The References are to Pages.)

PRINCIPAL ABBREVIATIONS.

C = cape
I. = island
L. = lake, loch, lough, etc.
Mt. = mountain
R. = river
Str. = strait

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